GATES LEARJET CORPORATION

maintenance manual

CHAPTER

29

HYDRAULIC POWER

RECORD OF TEMPORARY REVISIONS

Rev. No.	Date Inserted	Date Removed	Page Number	Rev. No.	Date Inserted	Date Removed	Page Number
29-1	Mar 31/80	Sep 4/81 Rev #9	29-10-03 Pg 204				

Chapter Section Subject	Page	Date
29-Title		
29-Record of Temp. Revisions		
*29-List of Effective Pages	1	Apr 30/82
29-Contents	1	Dec 2/77
29-Contents	2	Dec 2/77
29-00-00	1	Dec 2/77
29-00-00	2	Dec 2/77
29-00-00	3	Dec 2/77
29-00-00	4	Dec 2/77
29-00-00	5	Dec 2/77
29-00-00	6	Dec 2/77
29-00-00	7	Sep 4/81
29-00-00	8	Dec 2/77
29-00-00	9	Sep 4/81
29-00-00	10	Sep 4/81
29-00-00	11	Dec 2/77
29-00-00	101	Dec 2/77
29-00-00	201	Dec 2/77
29-00-00	202	Sep 4/81
29-10-00	1	Dec 2/77
29-10-00	2	Dec 2/77
29-10-00	3	Sep 4/81
29-10-00	4	Sep 4/81
29-10-01	201	Dec 2/77
29-10-01	202	Dec 2/77
29-10-02	1	Dec 2/77
29-10-02	201	Dec 2/77
29-10-02	202	Dec 2/77
29-10-03	201	Dec 2/77
29-10-03	202	Dec 2/77
29-10-03	203	Dec 2/77
29-10-03	204	Sep 4/81
29-10-03	205	Dec 2/77
29-10-03	206	Sep 4/81
29-10-04	201	Dec 2/77
29-10-04	202	Dec 2/77
29-10-05	201	Dec 2/77
29-10-05	202	Sep 4/81
29-10-05	203	Sep 4/81
29-10-06	201	Dec 2/77
29-10-06	202	Dec 2/77
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29-30-00	1	Dec 2/77

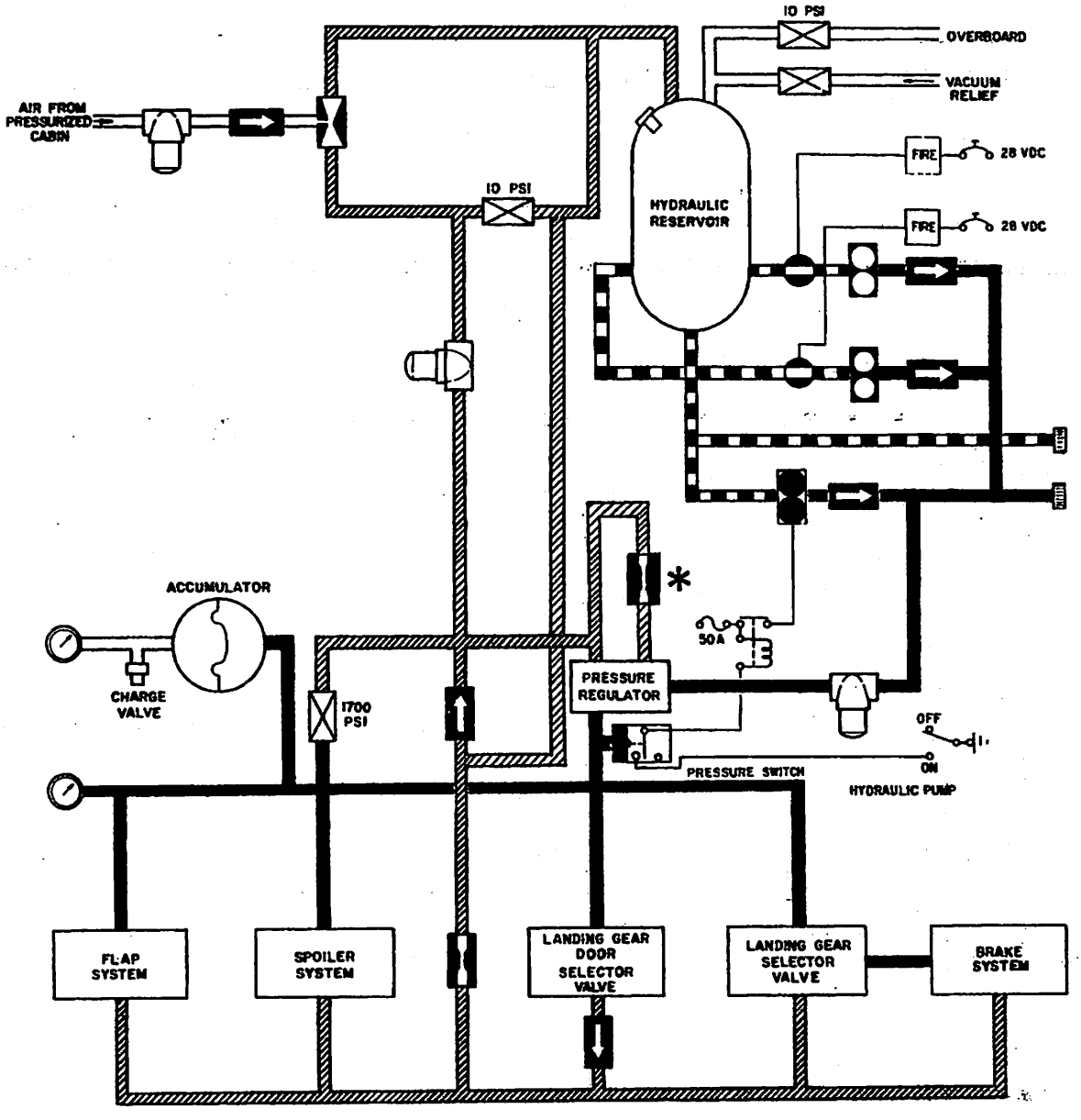
Insert Latest Revised Pages; Destroy Superseded or Deleted Pages.
*Asterisk indicates pages revised, added or deleted by current revision.
The portion of the text affected by the current revision is indicated by a vertical line in the outer margin of the page.

Subject	Chapter Section Subject	Page
GENERAL	29-00-00	
Description	29-00-00	1
Trouble Shooting	29-00-00	101
Maintenance Practices	29-00-00	
General	29-00-00	201
MAIN HYDRAULIC SYSTEM	29-10-00	
General	29-10-00	1
Reservoir	29-10-00	1
Supply Shutoff Valves	29-10-00	1
Pumps	29-10-00	1
Check Valves	29-10-00	3
Accumulator	29-10-00	3
Reservoir Pressure Regulator	29-10-00	3
Filters	29-10-00	3
Relief Valves	29-10-00	4
Hydraulic Pressure Regulator	29-10-00	4
Hydraulic Aspirator	29-10-00	4
Hydraulic System Reservoir - Maintenance Practices	29-10-01	
General	29-10-01	201
Removal/Installation	29-10-01	201
Supply Shutoff Valves - Description and Operation	29-10-02	
General	29-10-02	1
Supply Shutoff Valves - Maintenance Practices	29-10-02	
General	29-10-02	201
Removal/Installation	29-10-02	201
Hydraulic Pump - Maintenance Practices	29-10-03	
General	29-10-03	201
Removal/Installation	29-10-03	201
Inspection/Check	29-10-03	204
Hydraulic Filter - Maintenance Practices	29-10-04	
General	29-10-04	201
Removal/Installation	29-10-04	201
Hydraulic Accumulator - Maintenance Practices	29-10-05	
General	29-10-05	201
Removal/Installation	29-10-05	201
Approved Repairs	29-10-05	201
Pressure Regulator Filter - Maintenance Practices	29-10-06	
General	29-10-06	201
Removal/Installation	29-10-06	201
Cleaning/Painting	29-10-06	201

Subject	Chapter Section Subject	Page
Hydraulic Pressure Regulator-Maintenance Practices	29-10-07	
General	29-10-07	201
Removal/Installation	29-10-07	201
AUXILIARY HYDRAULIC PUMP	29-20-00	
Description	29-20-00	1
Operation	29-20-00	1
INDICATING	29-30-00	
General	29-30-00	1
Description	29-30-00	1

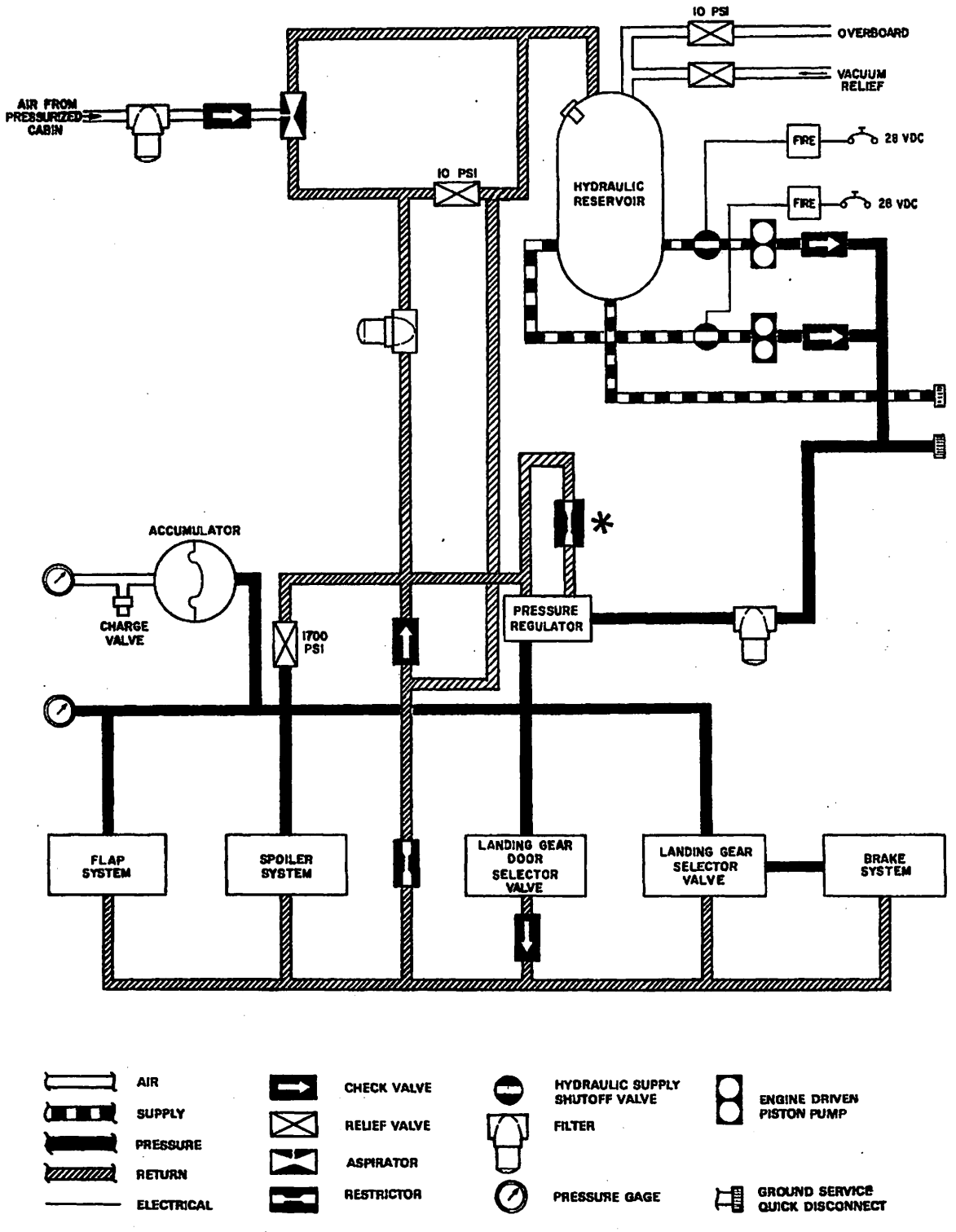
GENERAL - DESCRIPTION AND OPERATION

1. Description
 A. The hydraulic system supplies fluid (MIL-H-5606) under pressure of approximately 1500 psi (1450 psi on Aircraft 25-181 and Subsequent) to the brake, landing gear, flap and spoiler systems.
 B. Hydraulic fluid for systems operation is supplied from a reservoir through hydraulic supply shutoff valves to the engine driven hydraulic pumps. The hydraulic reservoir is pressurized to approximately 10 psi through a pressure line from the cabin and an aspirator located in the return line. On Aircraft 25-181 and Subsequent, the reservoir is pressurized to approximately 20 psi through a pressure line and pressure regulator from the bleed air duct.
 C. The engine driven hydraulic pumps supply fluid through check valves and a filter to the hydraulically operated systems upon demand.
 D. An accumulator absorbs and dampens pressure surges, thus preventing damage to the system. System pressure is maintained at 1200 to 1550 psi. If pressure increases to approximately 1700 psi, a relief valve opens and excess pressure is routed to the return system.
 E. The system is equipped with two direct reading pressure gages. One gage, located on the instrument panel, indicates hydraulic system pressure for the pilot and copilot. The second gage which is used by servicing personnel is located below the accumulator in the tailcone section and indicates accumulator pressure.
 F. Ground service quick-disconnects are provided for system pressurization and functional testing.
 G. The auxiliary hydraulic pump is plumbed to the hydraulic reservoir and electrically operated by the Hydraulic Pump Switch through a pressure switch. The pressure switch is plumbed to the fluid side of the accumulator. The pump provides hydraulic pressure for inflight standby power.



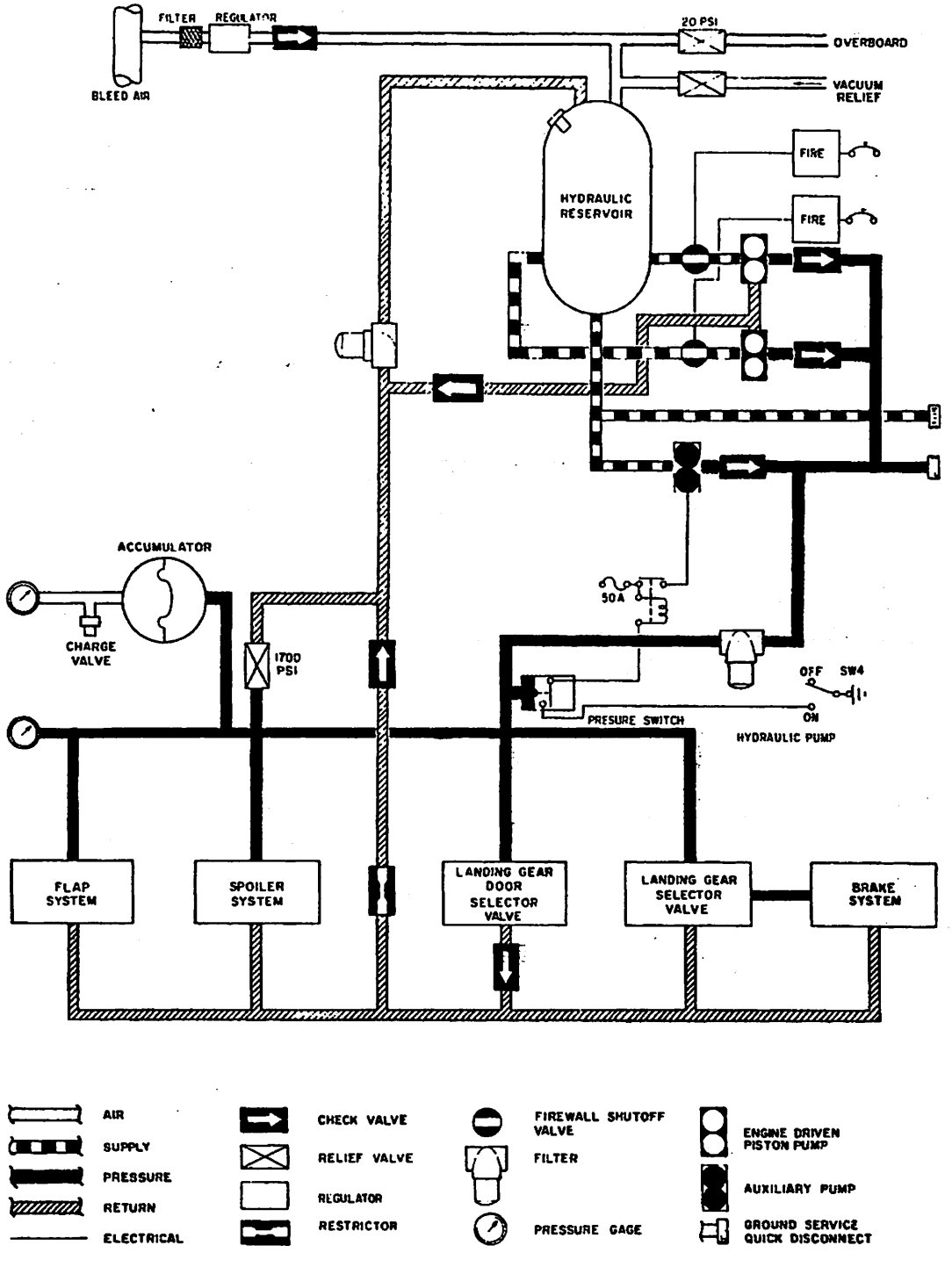
*25-090, 25-101 thru 25-153 and Aircraft Modified by AAK73-7.

Hydraulic System Schematic
Figure 1 (Sheet 1 of 4)

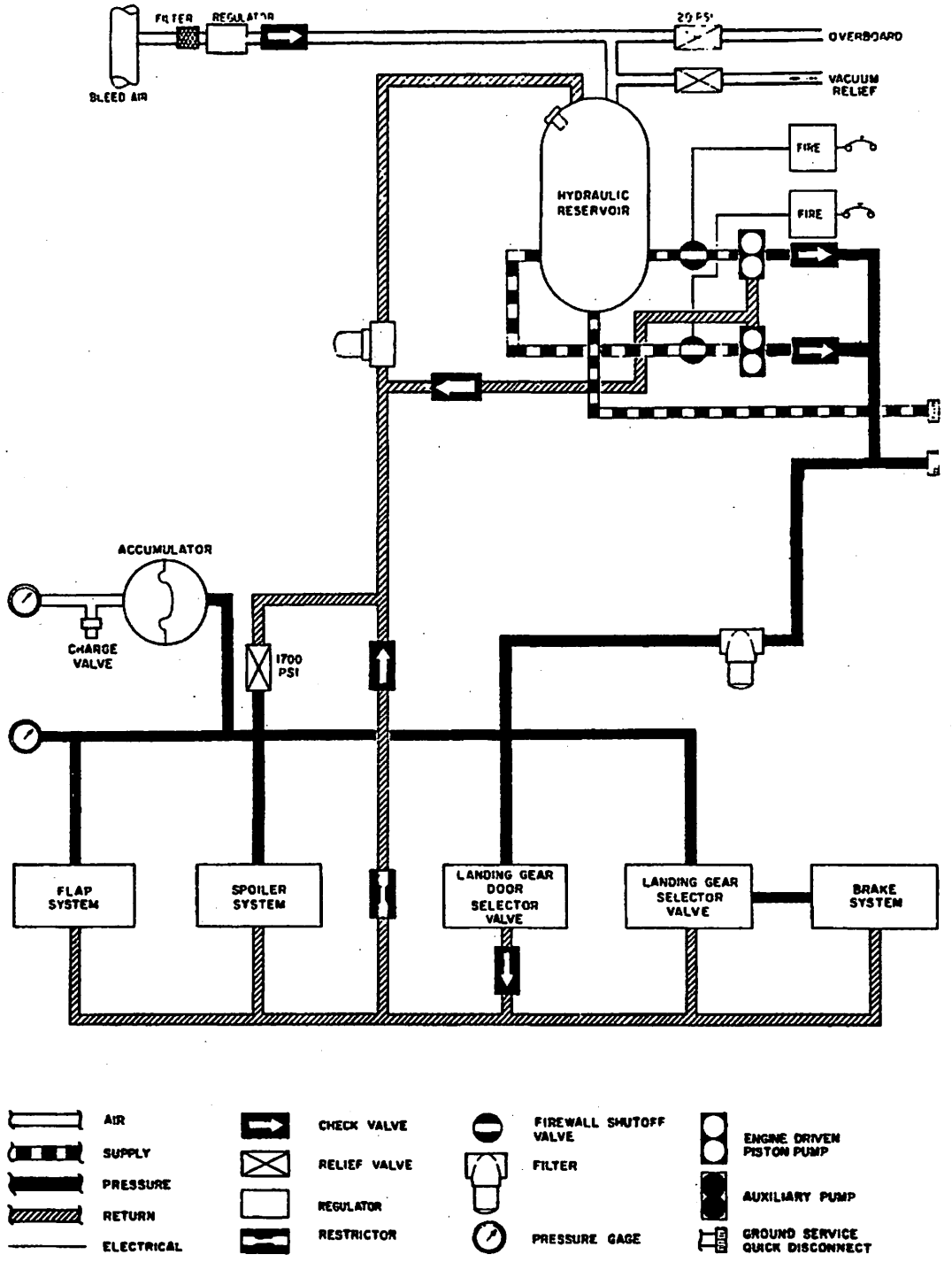


*25-090, 25-101 thru 25-153 and Aircraft Modified by AAK73-7.

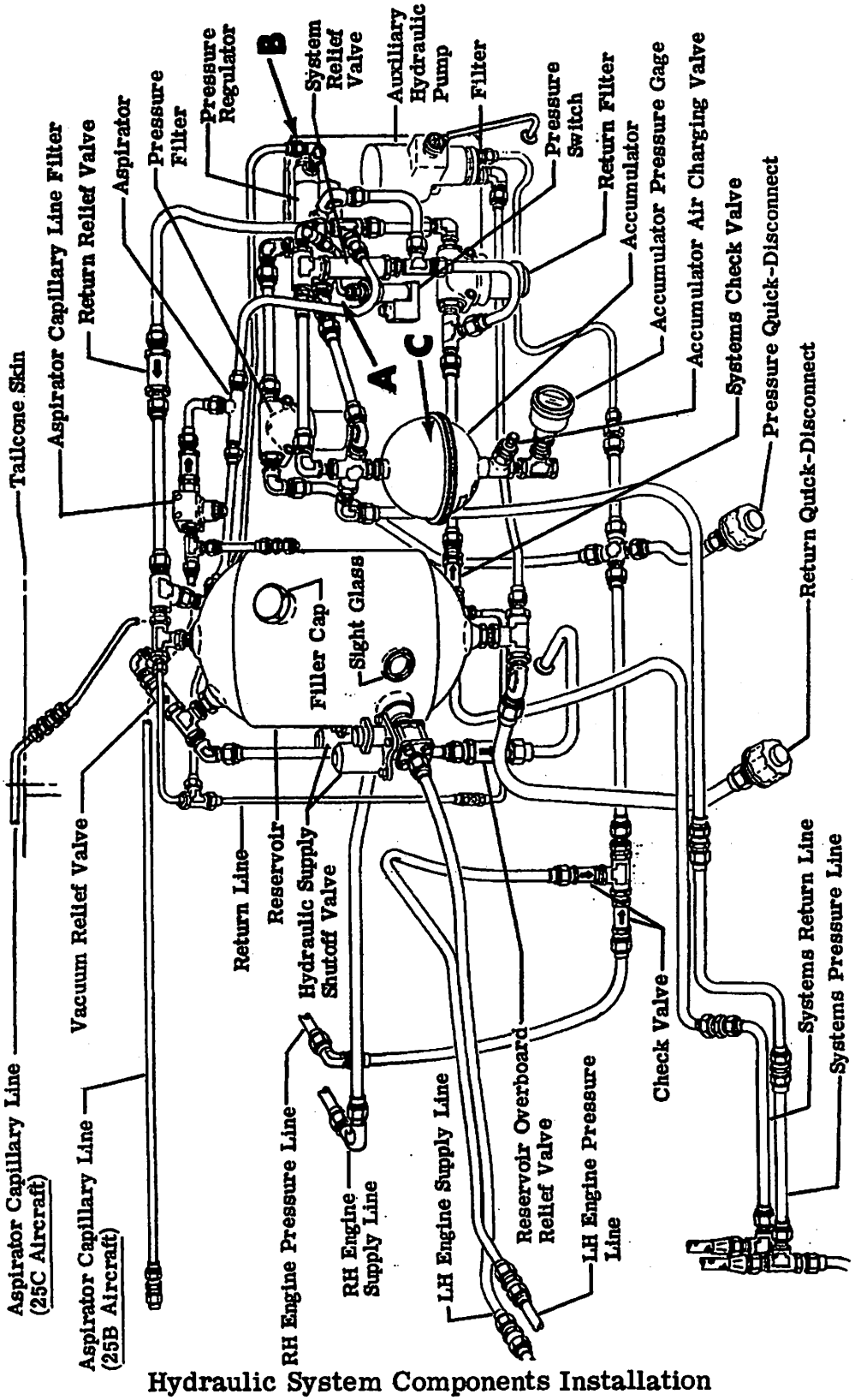
Hydraulic System Schematic
Figure 1 (Sheet 2 of 4)



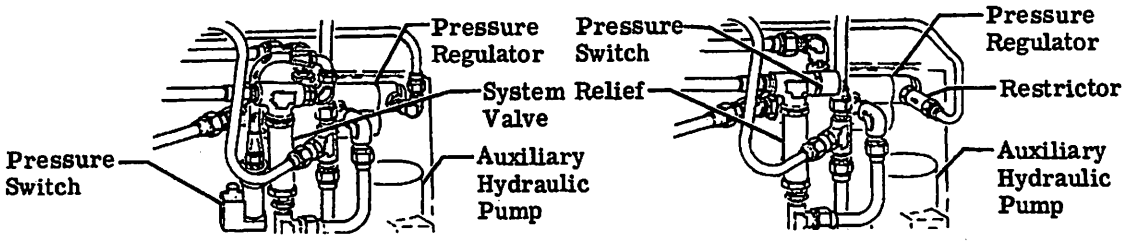
Hydraulic System Schematic
Figure 1 (Sheet 3 of 4)



Hydraulic System Schematic
Figure 1 (Sheet 4 of 4)



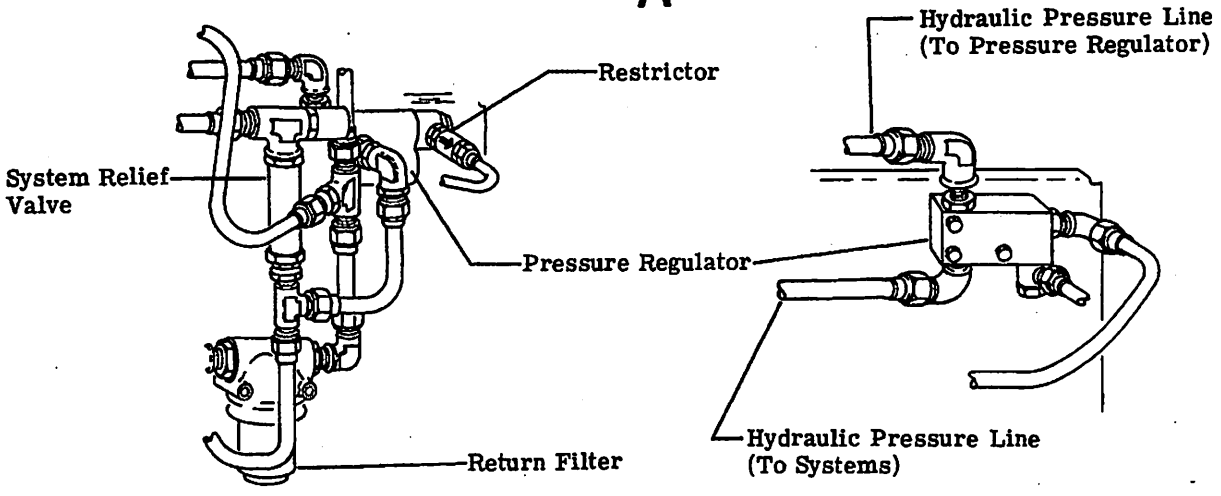
Hydraulic System Components Installation
Figure 2 (Sheet 1 of 6)



Aircraft 25-097 thru 25-100 and Aircraft Modified Per AMK72-6

Aircraft 25-090 and 25-101 thru 25-180 and Aircraft Modified by AMK72-10.

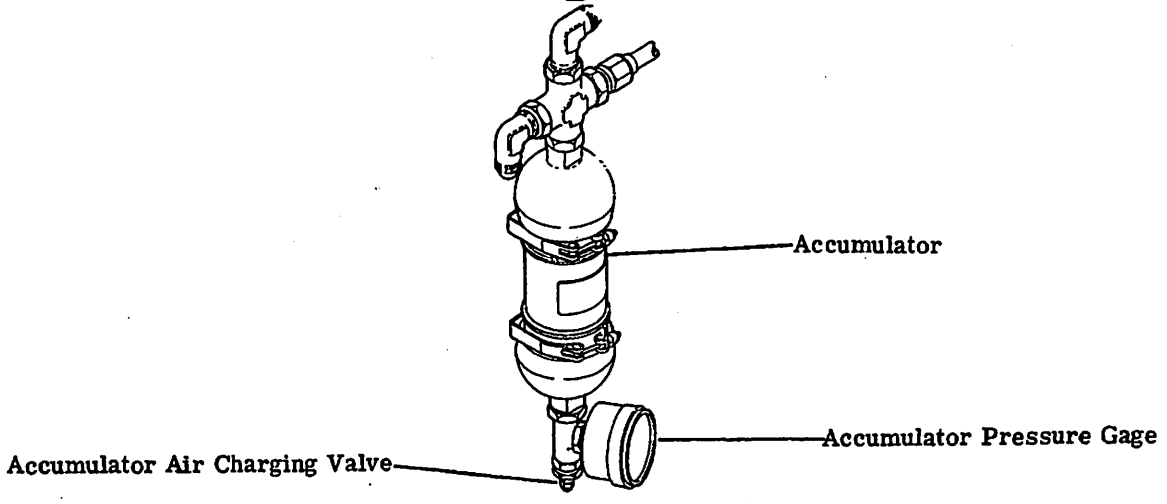
A



Aircraft 25-090, 25-101 thru 25-153 and Aircraft modified by AAK 73-7, except Aircraft modified per SSK 952 (Installation of AN6295 Hydraulic Pressure Regulator)

Aircraft 25-154 thru 25-180 and prior Aircraft modified per SSK 952 (Installation of AN6295 Hydraulic Pressure Regulator)

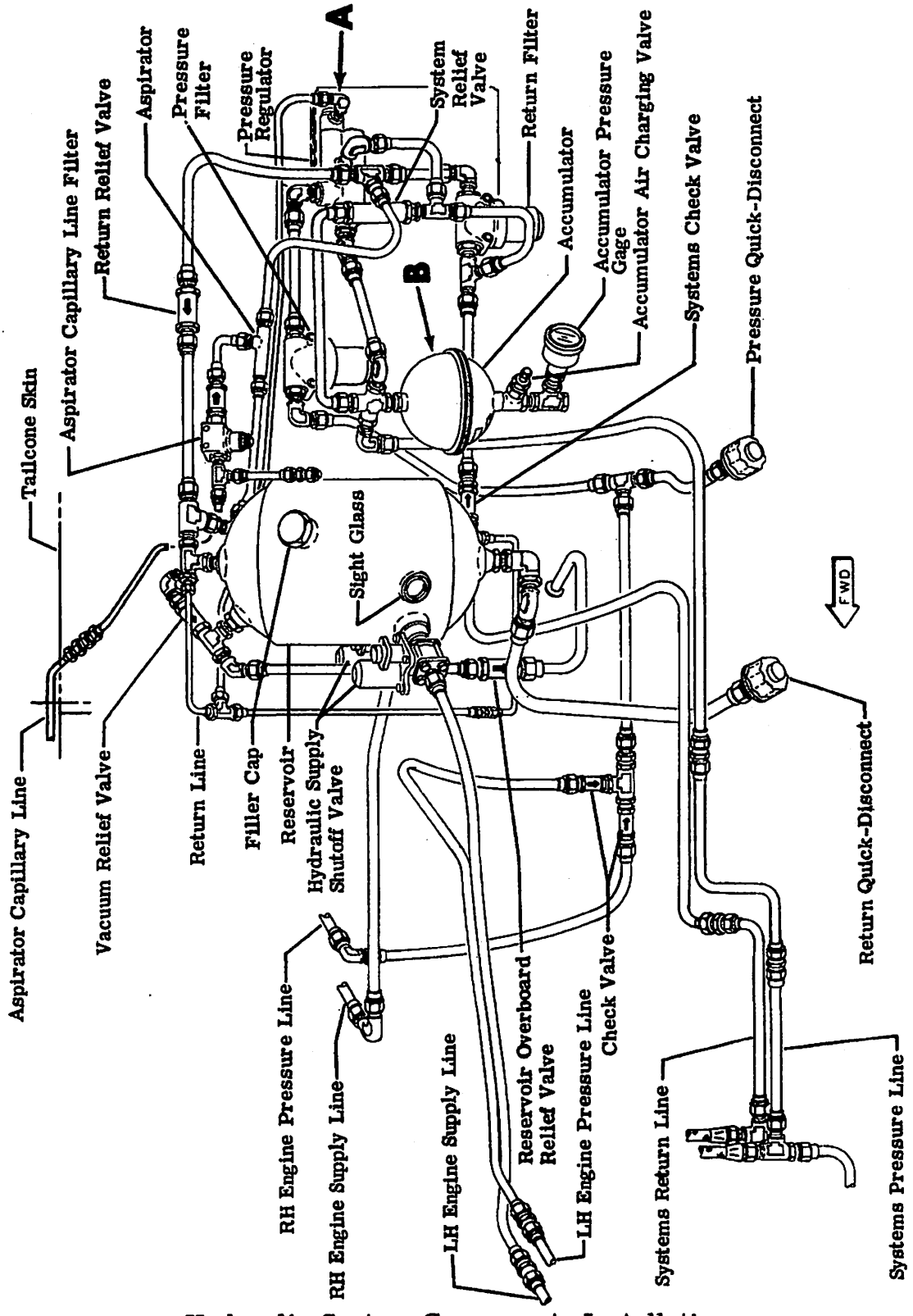
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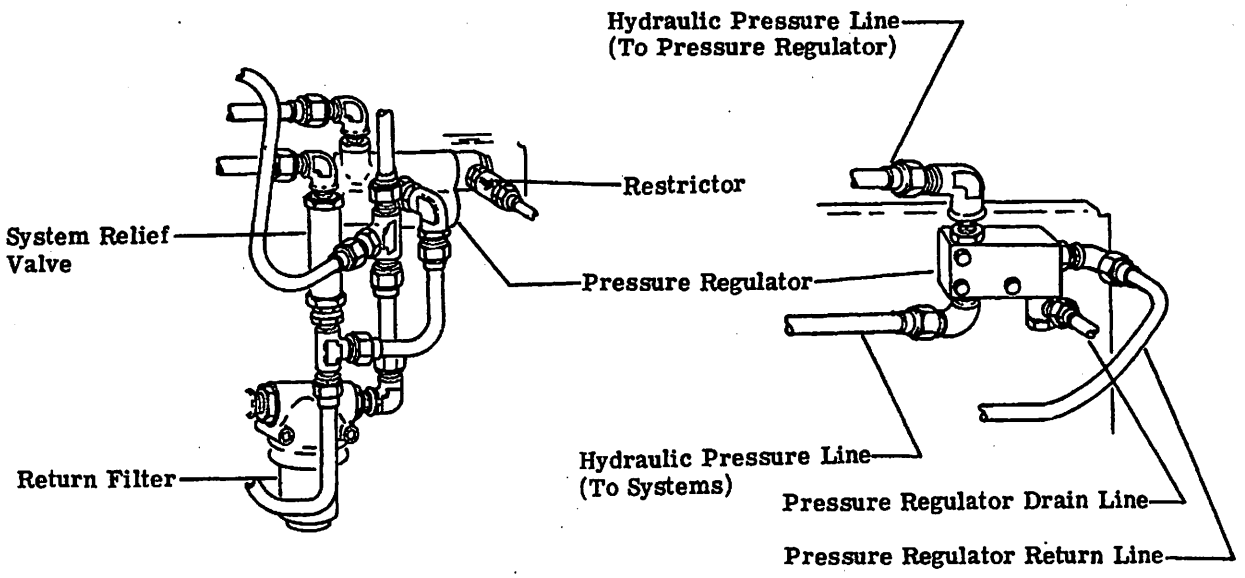
Aircraft 25-154 thru 25-180

C

Hydraulic System Components Installation
Figure 2 (Sheet 2 of 6)



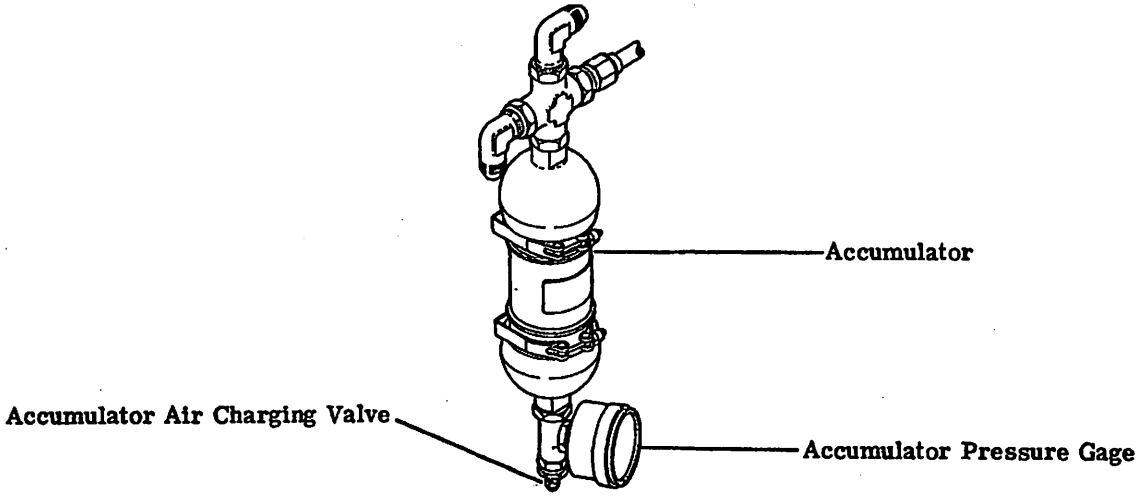
Hydraulic System Components Installation
Figure 2 (Sheet 3 of 6)



Aircraft 25-090, 25-101 thru 25-153 and Aircraft modified by AAK 73-7, except Aircraft modified per SSK 952 (Installation of AN6295 Hydraulic Pressure System)

Aircraft 25-154 thru 25-180 and prior Aircraft modified per SSK 952 (Installation of AN6295 Hydraulic Pressure Regulator)

A

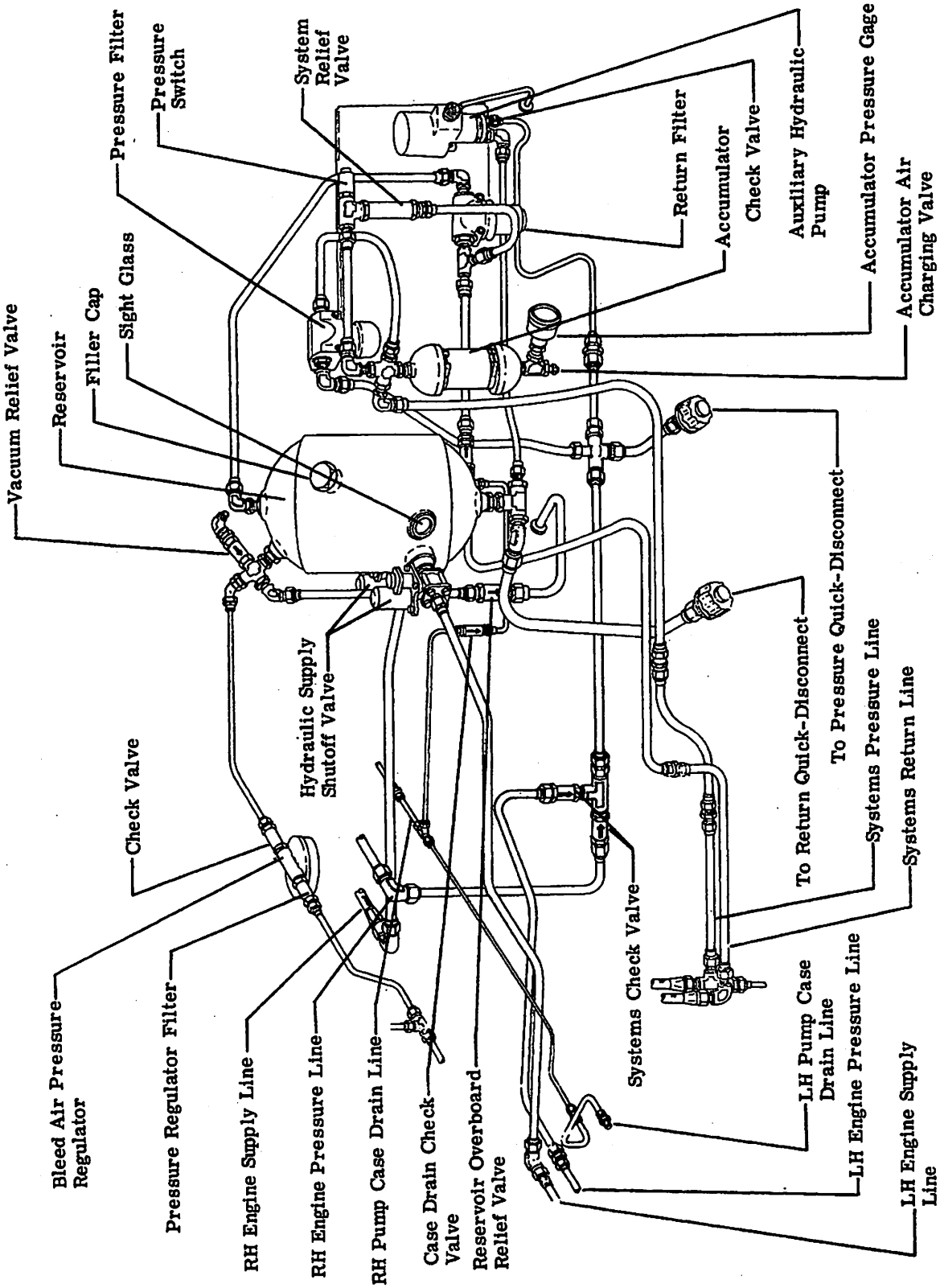


Aircraft 25-154 thru 25-180

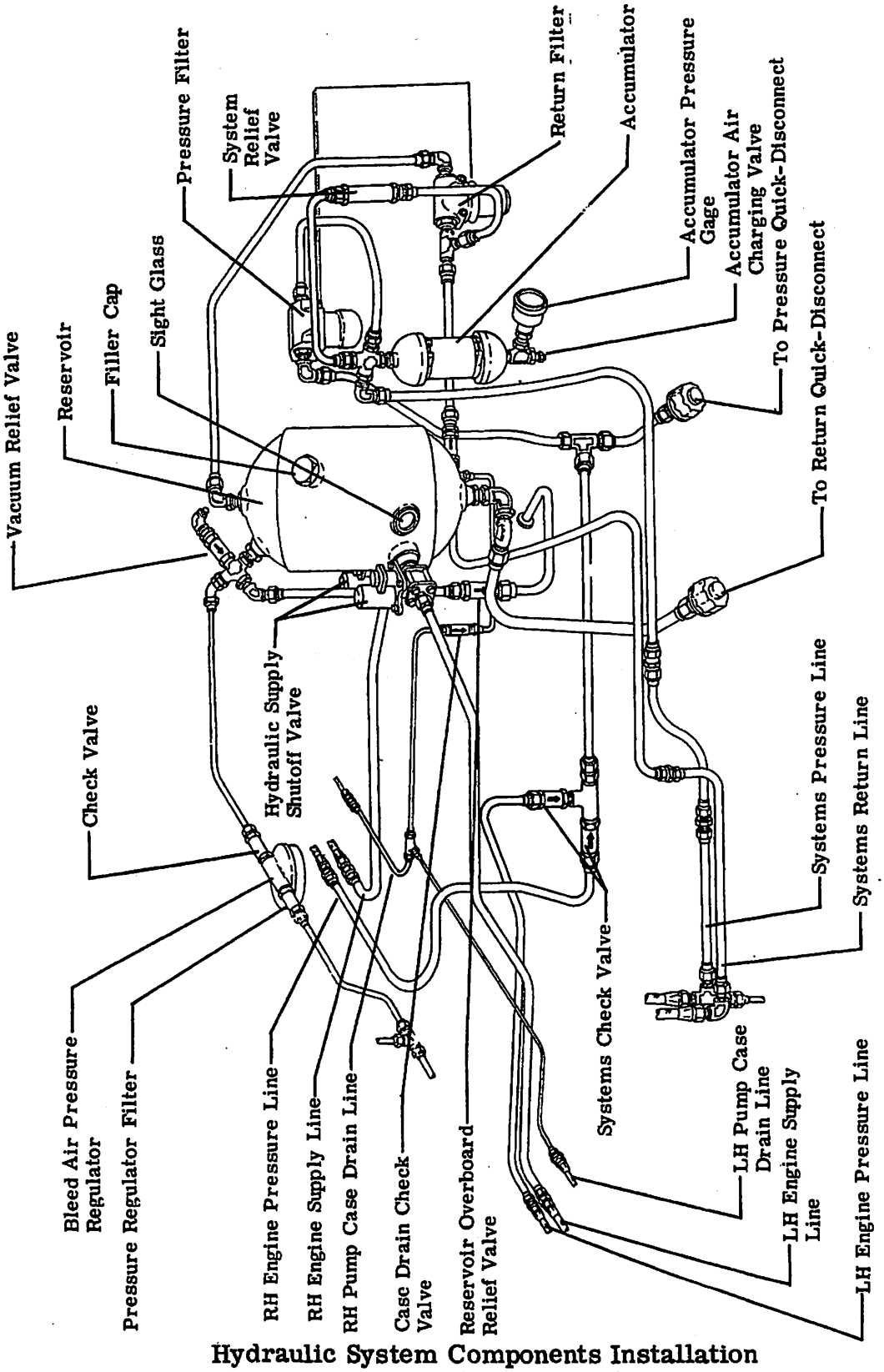
B

Hydraulic System Components Installation
Figure 2 (Sheet 4 of 6)

EFFECTIVITY: Aircraft 25-070 thru 25-180
Not Equipped with Auxiliary Hydraulic Pump



Hydraulic System Components Installation
Figure 2 (Sheet 5 of 6)

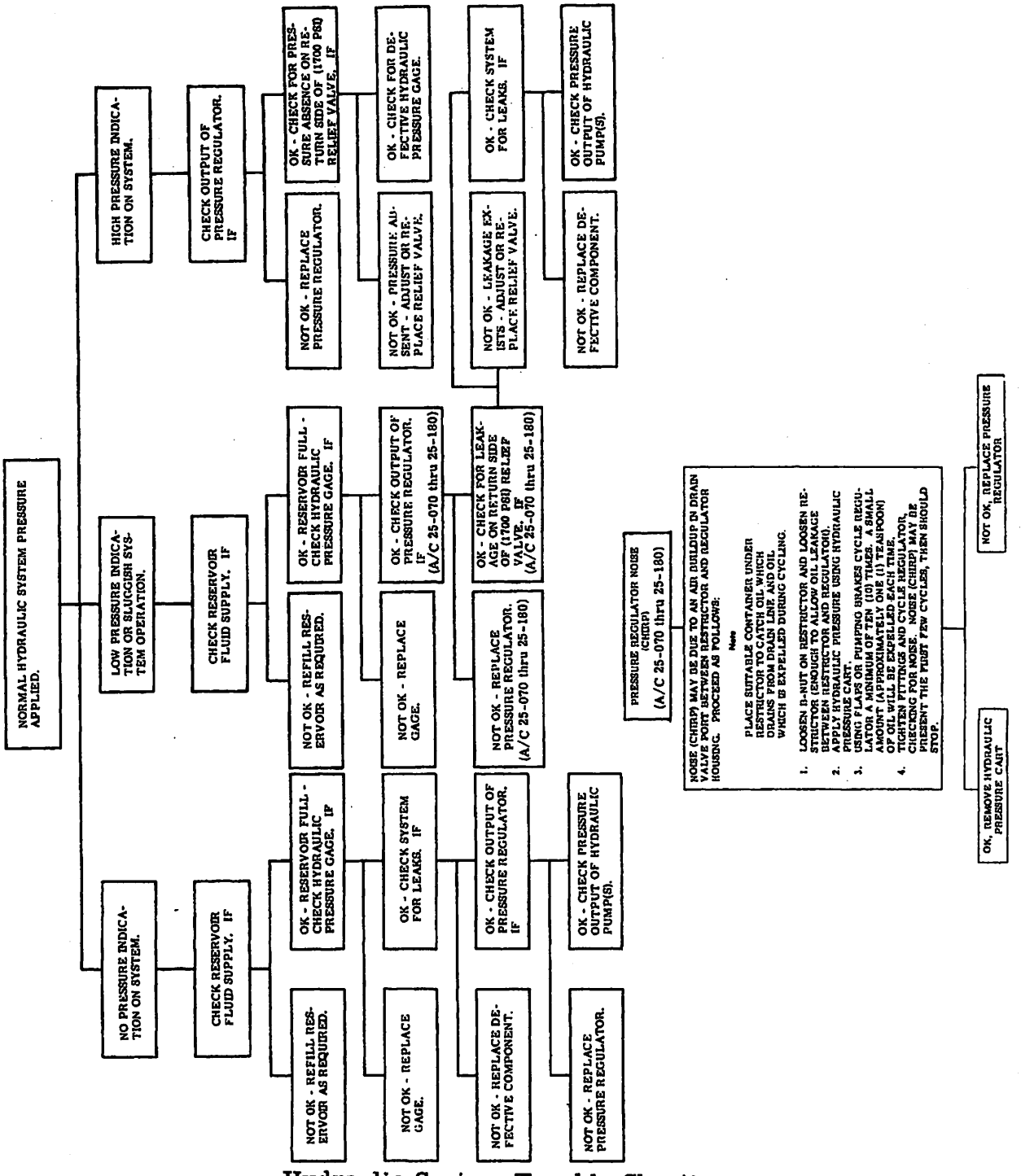


Hydraulic System Components Installation
Figure 2 (Sheet 6 of 6)

HYDRAULIC POWER - TROUBLE SHOOTING

1. General

A. See figure 101 for hydraulic trouble shooting.



Hydraulic System Trouble Shooting
Figure 101

HYDRAULIC POWER - MAINTENANCE PRACTICES

1. General
 A. General maintenance procedures should be thoroughly read and understood prior to performing any maintenance on the hydraulic system.
 B. Prior to removal of any hydraulic line, fitting or component the hydraulic system must be depressurized as follows:
 (1) Relieve residual hydraulic pressure in lines by pumping brakes.
 (2) Lower tailcone access door and disconnect battery quick-disconnects.
 (3) Loosen one of the hydraulic line nuts between the hydraulic reservoir and the relief valve to bleed off reservoir pressure. When pressure is released, tighten nut.
 (4) Loosen nut on accumulator Shrader valve to bleed off air pressure. When pressure is bled off, tighten Shrader valve.
 C. Prior to disconnecting any hydraulic fitting or component make provisions for catching fluid draining from fittings.
 D. Exercise extreme care to assure that all parts remain absolutely clean. A single grain of sand or particle of grit can cause internal failure of hydraulic components. Therefore, hydraulic lines and component fittings should be capped with clean caps immediately after removal. During installation of a hydraulic system component, the hydraulic lines and component fittings should remain capped as long as possible.
 E. When installing O-rings, keep mold flash of O-ring in one position to prevent twisting. When O-ring is in its groove, make sure it is evenly stretched around the circumference. Hydraulic cylinder glands and piston assemblies containing O-rings must be carefully inserted with only enough pressure to overcome friction.
 F. Do not replace hydraulic system fittings indiscriminately. Identify fittings as they are removed to assure that replacement conforms with original installation.
 G. All fittings and B-nuts should be properly aligned before connection.
 H. Service the hydraulic reservoir and accumulator after installation of components. (Refer to 12-00-00)
 I. Check emergency air bottle charge and service if required.
 J. To expel air from the landing gear, flaps, or spoiler systems, cycle each system until air is expelled using an auxiliary power unit. Do not use auxiliary pump for this purpose.
 K. Some hydraulic system maintenance requires the hydraulic supply shutoff valves be closed. To close supply shutoff valves proceed as follows:

 CAUTION: USE EXTREME CARE NOT TO DEPRESS EITHER ARMED SWITCH. DEPRESSING THE ARMED SWITCH WILL DISCHARGE THE FIRE EXTINGUISHER BOTTLES.

(1) With aircraft electrical power applied, pull each FIRE switch on the glareshield.

(2) Push in each FIRE switch with aircraft electrical power applied to open the shutoff valves.

L. When using a hydraulic ground power cart to pressurize the hydraulic system it is permissible to use either aircraft reservoir or the ground power cart reservoir. When the hydraulic system is pressurized using the ground power cart reservoir, the aircraft reservoir, above the fill cap, and the lines leading to the aircraft reservoir pressure regulator may become filled with hydraulic fluid. With the aircraft reservoir and lines filled, pressure may build. When aircraft reservoir pressure goes above the relief valve setting, fluid is drained overboard through the relief valve. It is desirable to connect a hose from the overboard drain to the power cart reservoir. A check valve is installed at the reservoir pressure regulator to prevent fluid from passing through the regulator. After pressurizing the aircraft hydraulic system using the ground power cart reservoir, the aircraft reservoir fluid level must be checked by removing the reservoir filler cap to ensure that an air space exists above the reservoir filler cap.

MAIN HYDRAULIC SYSTEM - DESCRIPTION AND OPERATION

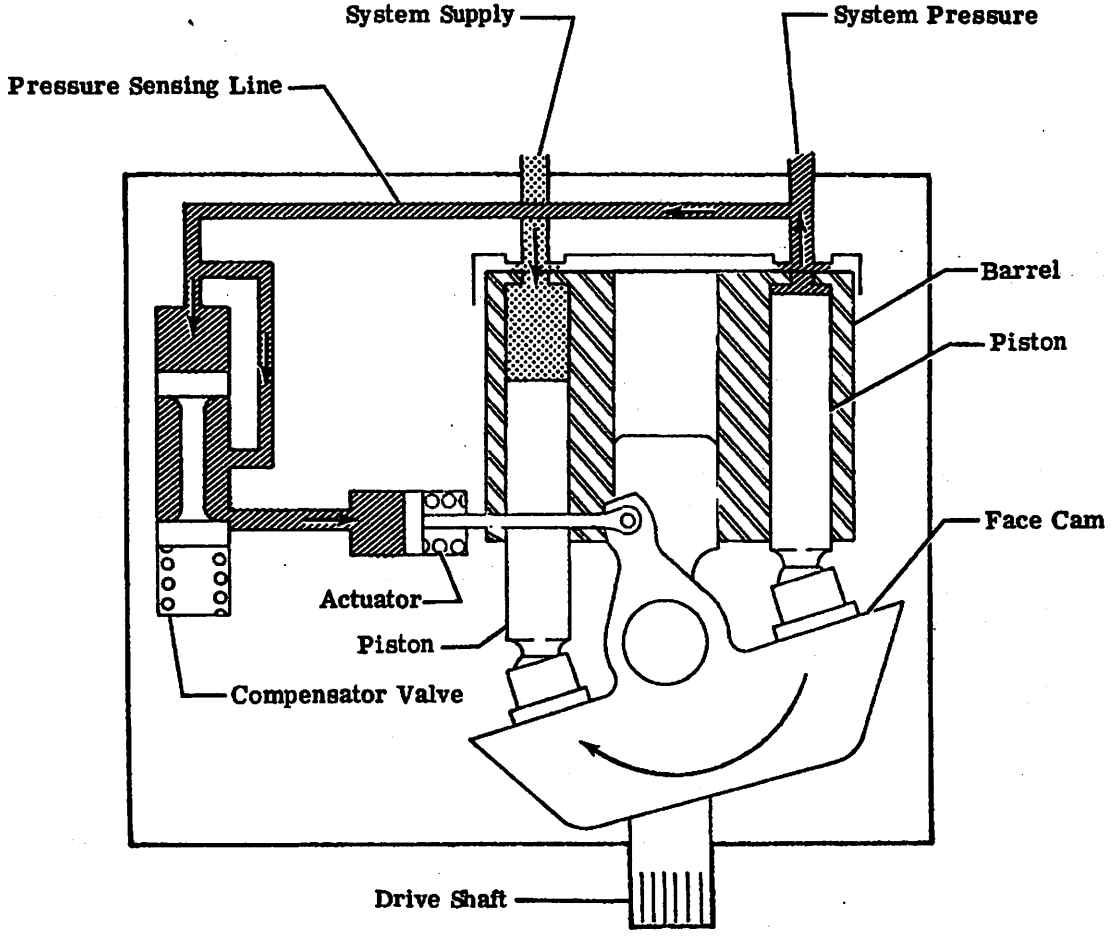
1. General
 A. The main hydraulic system consists of a fluid reservoir, two supply shutoff valves, two engine-driven pumps, check valves, an accumulator, a reservoir pressure regulator, two filters and four relief valves.

2. Reservoir
 A. The reservoir supplies fluid to the aircraft hydraulic system. The unit is an airtight pressurized vessel consisting of a sight glass for servicing purposes and a filler plug attached to the filler neck. The filler neck contains an aluminum mesh screen to prevent fluid contamination. The screen may be removed for cleaning by removing the filler cap and screen retaining nut.
 B. Reservoir pressure is maintained at approximately 10 psi through an aspirator and a pressure line to the cabin. On Aircraft 25-181 and Subsequent, reservoir pressure is maintained at approximately 20 psi through a bleed air pressure line and a reservoir pressure regulator. Excess reservoir pressure is vented overboard through a relief valve. The reservoir pressure maintains a positive fluid flow to the engine driven pumps at high flight altitudes.

3. Supply Shutoff Valves
 A. A hydraulic supply shutoff valve is installed in the supply line to each engine-driven hydraulic pump. The valves stop the flow of hydraulic fluid to the engine pumps in case of an emergency. The ball-type motor driven valves are controlled by the left and right FIRE switches. When either FIRE switch is depressed, the related fire extinguisher ARMED lights will light and the shutoff valve will close.

4. Pumps (See figure 1)
 A. An engine driven hydraulic pump mounted on the accessory gearbox of each engine supplies fluid, under pressure, to the hydraulic system. At approximately 7800 rpm, each pump delivers 2.25 gallons at 1500 psi. On Aircraft 25-181 and Subsequent, at approximately 6000 rpm each pump is capable of delivering 4.0 gallons per minute at 1450 psi.
 B. The hydraulic pumps are piston-type and provide positive displacement of hydraulic fluid. On Aircraft 25-181 and Subsequent, the hydraulic pump is basically a conventional, axial piston-type containing seven pistons installed in a rotating barrel assembly. The pistons ride on a face cam which causes the pistons to reciprocate in the barrel cylinders as the barrel rotates.

C. On Aircraft 25-181 and Subsequent, when the hydraulic system is not being used, the hydraulic pump output pressure will build to 1550 (±25) psi, at which time the pump output will drop to zero. As pump output pressure increases from 1450 to 1550 psi, a compensator valve gradually opens which causes an actuator to decrease the face cam angle. The decreased face cam angle decreases piston stroke which decreases pump output. When hydraulic system pressure drops as a result of system demand the pump output will increase.



Hydraulic Pump Block Diagram
Figure 1

5. Check Valves

A. Two types of check valves are used in the hydraulic system; cone type check valves and a swing gate check valve.

(1) Cone check valves are installed in the hydraulic lines to prevent reverse flow of fluid and to isolate hydraulically operated systems. Each check valve consists of a body, spring, and cone. A valve is located downstream of each engine-driven pump to prevent motoring of a deactivated pump and downstream of the auxiliary pump to prevent pump damage from back pressure.

(2) A swing gate check valve is installed in the return line. The swing gate check valve consists of a gate, body, cap, and spring. The gate opens when the flow direction coincides with the direction of gate opening. Reverse flow immediately closes the gate.

NOTE: Cone check valves and swing gate check valves are marked with directional arrows. It is suggested that maintenance personnel note the direction of the valve arrow and identify the flow direction on tubing or adjacent structure before removing component. (Reference MIL-STD-1247B for directional flow tape.)

6. Accumulator

A. The hydraulic accumulator is either a spherical unit or a cylindrical unit mounted on the hydraulic compartment panel assembly. The accumulator is used to absorb and dampen sudden hydraulic surges. The accumulator is divided into halves by a diaphragm in the spherical units and a piston in the cylindrical units. The accumulator is charged to 850 psi with dry air or nitrogen. An air charging valve and direct reading pressure gage are attached to the air side of the accumulator. A cross fitting at the fluid side of the accumulator has tubes connected to the filter, system relief valve and system pressure.

7. Reservoir Pressure Regulator

A. The reservoir pressure regulator is located in the pressure line between the bleed air duct and the hydraulic reservoir. Bleed air passes through a filter, the pressure regulator, and a check valve for reservoir pressurization.

8. Filters

A. A hydraulic filter is installed in the pressure and return hydraulic lines. The pressure filter prevents foreign particles from entering the hydraulic system with the pump output fluid. The return filter removes foreign particles from the hydraulic fluid before it enters the reservoir. Incorporated within the filters is a replaceable micronic element and a relief valve in the filter head. The relief valve opens at 50 (±5) psi differential pressure to bypass fluid if the filter element becomes clogged.

9. Relief Valves

A. One relief valve is installed in the system pressure line, one in the reservoir vent line, one in the emergency air pressure line and one in the reservoir vacuum line.

NOTE: Relief valves are marked with directional flow arrows. It is suggested that maintenance personnel note the direction of the valve arrow and identify the flow direction on tubing or adjacent structure before removing component. (Reference MIL-STD-1247B for directional flow tape.)

(1) The pressure relief valve is installed to prevent damage to the system due to excessive pressure from an improperly adjusted ground test cart or a hydraulic pump malfunction. It is a spring loaded poppet valve that bypasses fluid from the pressure line into the return line when system pressure exceeds 1700 psi. Free flow in the opposite direction can occur any time the return line pressure exceeds that of the pressure line.

(2) The reservoir overboard relief valve, set at 10 or 20 psi, prevents overpressurization of the reservoir. Reservoir pressure in excess of 10 to 20 psi is vented overboard through the valve.

(3) The vacuum line relief valve prevents a vacuum lock in the hydraulic reservoir on initial system pressurization.

(4) The emergency air relief valve, set to relieve at 3350 (±50) psi, prevents overpressurization of the emergency air bottle supply. Excess pressure is vented to atmosphere. The valve will reset at 3015 psi (minimum).

10. Hydraulic Pressure Regulator (25-061, 25-070 thru 25-180)

A. The hydraulic pressure regulator is an unloading valve for regulating and maintaining, within limits, the airplane hydraulic system pressure. The regulator is set to relieve at 1525-1550 psi and reset at a pressure of 1200-1350 psi. The regulator relieves the hydraulic pumps of working pressure when the system is in static equilibrium. On Aircraft 25-090 and 25-101 thru 25-153, a restrictor is installed in the regulator drain port. This restrictor dampens inherent noises in the pressure regulator unloading valve. On aircraft that have not been operated for an extended period of time, regulator noise (chirp) may be apparent, then stop after regulator has cycled a few times.

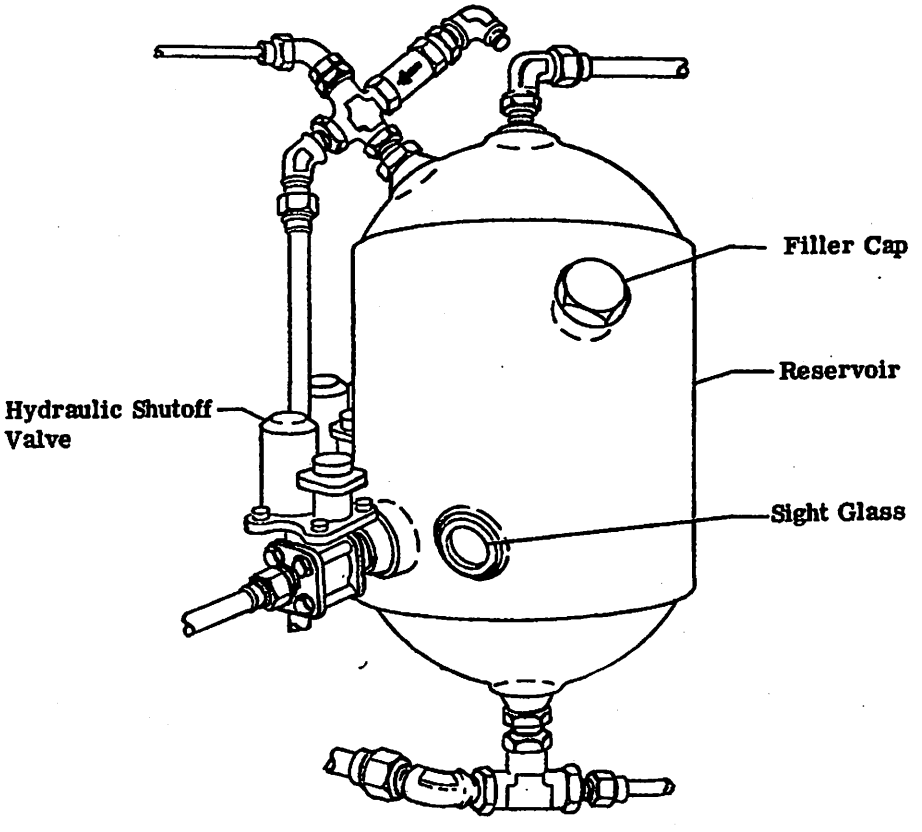
11. Hydraulic Aspirator (25-061, 25-070 thru 25-180)

A. The aspirator is located in the return line between the pressure regulator and reservoir. Return fluid, passing through the aspirator, creates a venturi-type action which allows the aspirator to draw air pressure from the cabin. Cabin air pressure passes through a capillary line, filter, and check valve to the aspirator for reservoir pressurization.

HYDRAULIC SYSTEM RESERVOIR - MAINTENANCE PRACTICES

1. General
 A. Access to the reservoir is through the tailcone access door.

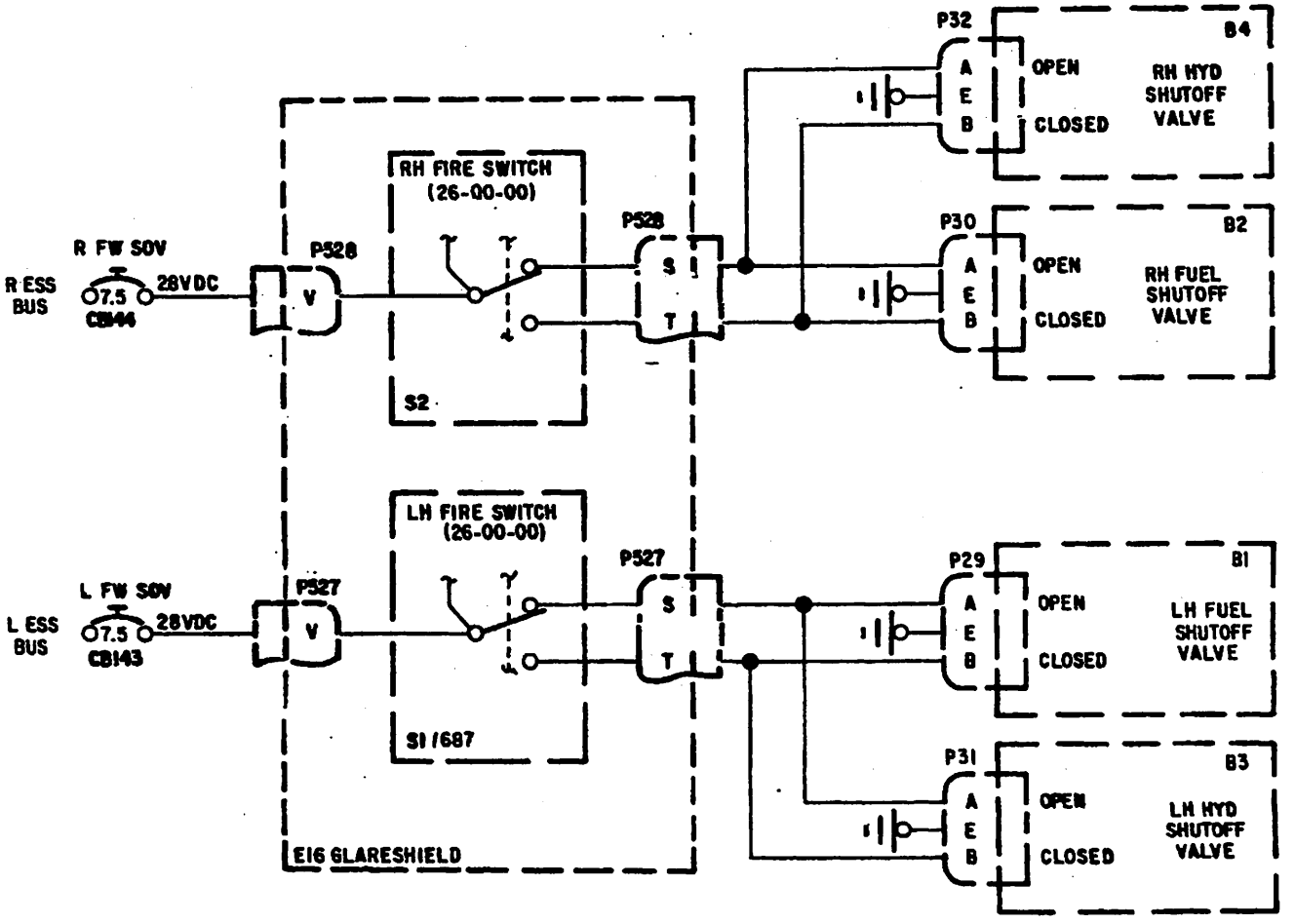
2. Removal/Installation
 A. Remove Hydraulic Reservoir (See figure 201)
 (1) Lower tailcone access door and disconnect battery quick-disconnects.
 (2) Depressurize hydraulic system and drain hydraulic reservoir.
 (3) Disconnect electrical connectors from the hydraulic supply shutoff valves and reservoir fittings.
 (4) Disconnect hydraulic tube assemblies at the hydraulic supply shutoff valves and reservoir fittings.
 (5) Loosen clamps securing the reservoir to the clamp support and remove reservoir from the aircraft.
 (6) Remove bolts securing the hydraulic supply shutoff valve and flanged fitting to reservoir.
 (7) Remove remaining flange fitting from reservoir.
 B. Install Hydraulic Reservoir (See figure 201)
 (1) Clean all fittings prior to installation.
 (2) Install elbow, tees, and flanged fittings on reservoir. Apply loctite hydraulic sealant to male threads of fittings, omitting the first 1-1/2 threads.
 (3) Install hydraulic supply shutoff valves and flanged fittings on reservoir flange fitting and secure with attaching parts. Torque nuts 20 to 25 inch-pounds.
 (4) Position reservoir in clamp assemblies and tighten clamp bolts only enough to hold reservoir.
 (5) Connect tube assemblies to fittings on reservoir and to hydraulic supply shutoff valves.
 (6) Tighten reservoir clamp bolts. Torque nuts 15 to 20 inch-pounds.
 (7) Connect hydraulic supply shutoff valve electrical connectors.
 (8) Service hydraulic reservoir and hydraulic accumulator. Refer to 12-00-00.
 (9) Connect battery quick-disconnects and secure tailcone access door.



Hydraulic Reservoir Installation
Figure 201

SUPPLY SHUTOFF VALVES - DESCRIPTION AND OPERATION

1. General
 A. A hydraulic supply shutoff valve is installed in the supply line to each engine-driven hydraulic pump. The valves stop the flow of hydraulic fluid to the engine-driven pumps in case of an emergency.
 B. The ball-type motor driven valves are controlled by the left and right press-to-close FIRE Switches. When either FIRE Switch is depressed, the related fire extinguisher ARMED lights will light and the shutoff valve will close and the related shutoff valve indicator light (pinhead light located inboard of the FIRE switch) will illuminate.

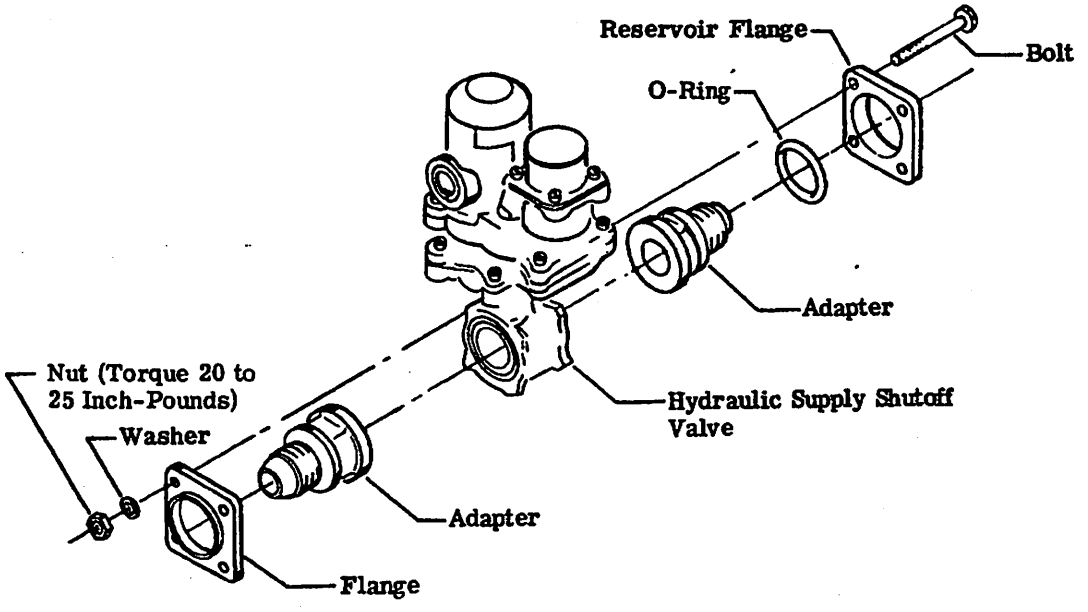


Hydraulic Supply Shutoff Valve Control Schematic
Figure 1

SUPPLY SHUTOFF VALVES - MAINTENANCE PRACTICES

1. General
 A. The supply shutoff valves are bolted to the hydraulic reservoir located in the tailcone.
 B. Removal of both valves is identical.

2. Removal/Installation
 A. Remove Supply Shutoff Valve (See figure 201)
 (1) Lower tailcone access door and disconnect battery quick-disconnects.
 (2) Depressurize the hydraulic system.
 (3) Drain hydraulic fluid from reservoir.
 (4) Disconnect engine supply line at shutoff valve.
 (5) Disconnect shutoff valve electrical connector.
 (6) Remove nuts, washers, and bolts installed through shutoff valve flanges and remove shutoff valve, adapter, and flange from the aircraft.
 (7) Remove adapter, flange, and O-ring from reservoir.
 B. Install Supply Shutoff Valve (See figure 201)
 (1) Install new O-ring, adapter, and flange on reservoir.
 (2) Assemble opposite adapter, flange and shutoff valve, and secure shutoff valve to reservoir-mounted flange by bolting the flanges together using bolts, washers, and nuts. Torque nuts 20 to 25 inch-pounds.
 (3) Connect engine supply line to shutoff valve.
 (4) Connect shutoff valve electrical connector.
 (5) Service the hydraulic reservoir. Refer to 12-00-00.
 (6) Pressurize the hydraulic system and check for leaks.
 (7) Connect battery quick-disconnects and secure tailcone access door.



Hydraulic Supply Shutoff Valve Assembly
Figure 201

HYDRAULIC PUMP - MAINTENANCE PRACTICES

1. General
 A. The engine driven hydraulic pumps are located on the bottom side of each engine on the accessory gearbox.
 B. Access to the hydraulic pump is gained by removing the lower engine nacelle.

2. Removal/Installation
 A. Remove Hydraulic Pump (Aircraft 25-061, -070 thru -180) (See figure 201)
 (1) Remove lower engine nacelle.
 (2) Close hydraulic supply shutoff valves.
 (3) Depressurize hydraulic system.
 (4) Remove clamp from around cluster of drain lines.
 (5) Disconnect fitting which attaches drain line to pump and remove drain line.

 NOTE: On Aircraft with wire braided teflon hydraulic hoses, the hoses will take a permanent set after exposure to high temperatures. The set is not detrimental to the hose and no attempt should be made to straighten the hose. Use care when removing hoses from the pump to avoid bending the "set" hose.

 (6) Disconnect clamps, attaching hydraulic supply and pressure hoses to reducers, and remove hoses from reducers.
 (7) Remove four bolts and washers attaching adapter plate to accessory gearbox.
 (8) Remove adapter plate (with pump attached) from accessory gearbox. Remove gasket which is mounted between adapter plate and gearbox.
 (9) Remove four bolts and washers attaching pump to adapter plate and separate pump from adapter plate. Remove jacket which is mounted between pump and adapter plate.
 (10) Remove reducers and packings from pump; discard packings.
 (11) Inspect reducers for serviceability and retain for installation on new pump, if serviceable.
 B. Install Hydraulic Pump (Aircraft 25-061, -070 thru -180) (See figure 201)
 (1) Install reducers and new packings in supply and pressure ports of hydraulic pump.
 (2) Assemble new gasket and pump assembly on adapter plate and, using Loctite compound Grade "A", secure with four washers and bolts.

(3) Position new gasket on accessory gearbox.
(4) Lubricate male spline of pump and female spline on engine hydraulic pump pad with either Mobil Grease No. 29 or Braycote 664S (Bray Oil Co.).
(5) Position adapter plate (with pump attached) over gasket on accessory gearbox. Align splines of pump with mating parts in gearbox. Secure adapter plate to gearbox with four washers and nuts.
(6) Attach pump drain line to bottom port of pump, using new packing. Clock drain line to where it meets the cluster of drain lines. Install clamp around cluster of drain lines.

NOTE: On aircraft with wire braided teflon hydraulic hoses, the hoses will take a permanent set after exposure to high temperature. When reinstalling old hose, use care not to bend the "set" hose. If installing a new wire braided teflon hose, do not bend the large (-8) hose at less than a 5-inch bend radius and do not bend the small (-6) hose at less than a 4-inch bend radius.

(7) Position clamps on inlet and outlet hoses. Slide hoses over reducers and tighten clamps.
(8) Remove aft plug on top of hydraulic pump and fill pump with MIL-H-5606 hydraulic fluid.
(9) Reinstall plug and safety wire.
(10) Open hydraulic supply shutoff valves.
(11) Check hydraulic fluid level (Refer to 12-10-02)
(12) Check hydraulic pump for leakage.
(13) Install lower engine nacelle.

C. Remove Hydraulic Pump (Aircraft 25-181 and Subsequent) (See figure 201)
(1) Remove lower engine nacelle to gain access to pump.
(2) Close hydraulic supply shutoff valves.
(3) Depressurize hydraulic system.
(4) Disconnect and remove seal drain line at pump.

NOTE: On Aircraft with wire braided teflon hydraulic hoses, the hoses will take a permanent set after exposure to high temperatures. The set is not detrimental to the hose and no attempt should be made to straighten the hose. Use care when removing hoses from the pump to avoid bending the "set" hose.

(5) Disconnect clamps and remove pressure and supply lines from pump. Cap pressure and supply lines immediately.
(6) Disconnect clamps and remove case drain line.

(7) Remove four nuts and washers attaching pump to accessory gear box and remove pump and gasket.
(8) Remove fittings and packings from pump. Discard packings.
(9) Inspect fittings for serviceability and if serviceable retain for installation on new pump.

D. Install Hydraulic Pump (Aircraft 25-181 and Subsequent) (See figure 201)

NOTE: Assure that hydraulic pump case is filled with hydraulic fluid (MIL-H-5606) prior to installation.

(1) Install fittings with new packings on pump.
(2) Position new gasket on accessory gearbox.

CAUTION: WHEN AIRCRAFT IS EQUIPPED WITH VARIABLE VOLUME HYDRAULIC PUMP 6600301-3, DO NOT LUBRICATE MALE SPLINE OF PUMP OR THE FEMALE SPLINE ON ENGINE HYDRAULIC PUMP PAD. THE PUMPS INCORPORATE A SELF-LUBRICATING FEATURE AND ANY EXTERNAL LUBRICANT MAY BE DETRIMENTAL.
ON AIRCRAFT EQUIPPED WITH VARIABLE VOLUME HYDRAULIC PUMP 6600301-1, LUBRICATE MALE SPLINE OF PUMP AND FEMALE SPLINE ON ENGINE HYDRAULIC PUMP PAD WITH EITHER MOBIL GREASE NO. 29 OR BRAYCOTE 664S (BRAY OIL CO.).

(3) On aircraft equipped with 6600301-1 pump, lubricate male spline of pump and female spline on engine hydraulic pump pad with either Mobil Grease No. 29 or Braycote 664S (Bray Oil Co.).
(4) Position pump on accessory gearbox with splines aligned and secure with four nuts and washers.

NOTE: On aircraft with wire braided teflon hydraulic hoses, the hoses will take a permanent set after exposure to high temperature. When reinstalling old hose, use care not to bend the "set" hose. If installing a new wire braided teflon hose, do not bend the large (-8) hose at less than a 5-inch bend radius and do not bend the small (-6) hose at less than a 4-inch bend radius.

(5) Remove caps and connect pressure and supply lines. Secure with clamps.
(6) Connect seal drain line.

(7) Fill pump through case drain fitting with MIL-H-5606 hydraulic fluid and connect case drain line.
(8) Open hydraulic supply shutoff valves.
(9) Check hydraulic pump for leakage. Refer to Inspection/Check.
(10) Install lower engine nacelle.

3. Inspection/Check

A. Check Hydraulic Pump for Leakage

(1) Remove lower engine nacelle.
(2) Disconnect seal drain line at hydraulic pump.
(3) Wipe excess fluid from seal drain port.
(4) Start engine to obtain normal hydraulic system pressure. With pressure applied for 5 minutes, maximum allowable leakage shall not exceed 15 drops per minute (on Aircraft 25-181 and Subsequent, maximum allowable leakage shall not exceed one drop per minute) from the seal drain port.

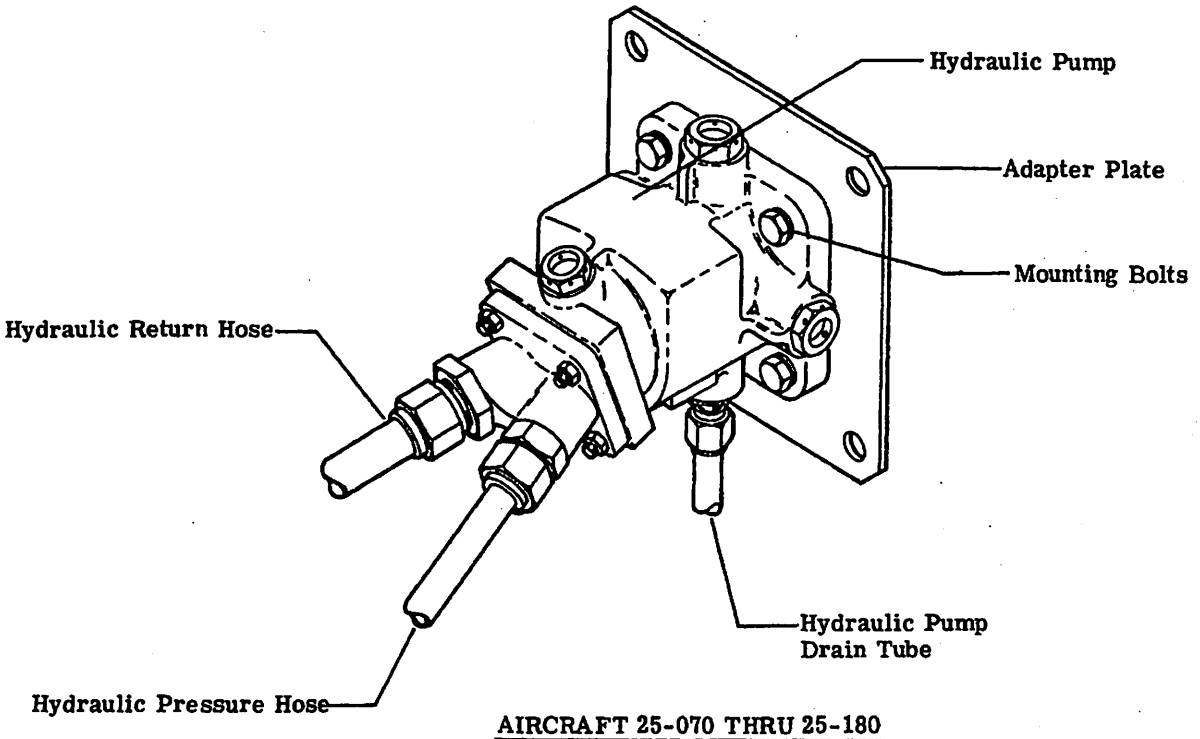
NOTE: The preceding allowable limits for leakage are at normal hydraulic system pressure. As the engine is slowed during engine shutdown, normal system pressures are no longer on the pump which allows the pump shaft to move away from the pump internal seal and a temporary leakage to occur. The temporary leakage is normal during system shutdown and the pump should not be rejected because the temporary leakage exceeds the maximum allowable leakage of this test.

CAUTION: USE EXTREME CARE NOT TO BUMP PUMP SHAFT OR TIGHTEN MOUNTING NUTS IN SUCH A MANNER AS TO INDUCE MISALIGNMENT. BUMPING THE PUMP SHAFT OR IMPROPER TIGHTENING OF MOUNTING NUTS WILL CAUSE THE SHAFT SEAL TO LEAK.

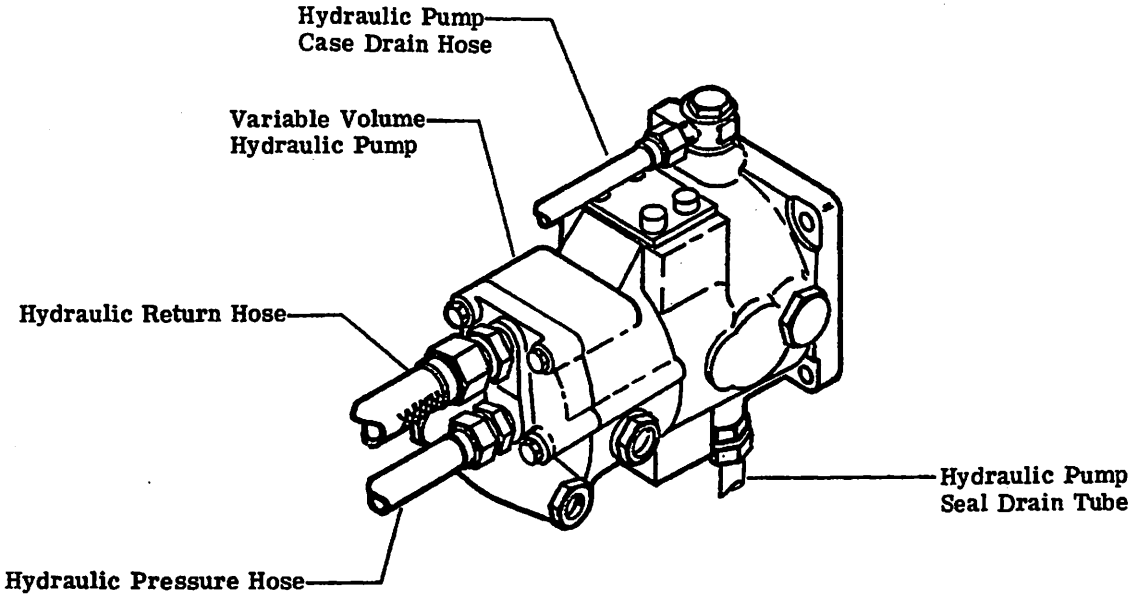
NOTE: • If a leakage should exceed acceptable limits proceed as follows:

- Method 1. Shut down engine and loosen the four nuts attaching pump to accessory gear box and reposition (jiggle) pump. Torque attaching nuts evenly. This method allows the pump shaft to center in its internal seal and stop a leak.

- Method 2. Shut down engine and remove four nuts and washers attaching pumps to accessory gear box. Pull pump out of accessory box enough to rotate pump shaft by hand. Align pump splines with gear box splines and install hydraulic pump in accordance with the Installation Procedures.



AIRCRAFT 25-070 THRU 25-180



AIRCRAFT 25-181 AND SUBSEQUENT

Engine Driven Hydraulic Pump Installation
Figure 201

- It may be necessary to repeat Methods 1 and/or 2 several times to ensure that the pump shaft centers in its internal seal to stop a leak. Repeat steps (3) and (4) after each adjustment to ensure the leak is within acceptable limits. If repeated attempts to stop a leak fails, replace pump in accordance with Removal/Installation Procedures.

(5) Shut down engine.
(6) Connect seal drain line and install lower engine nacelle.

HYDRAULIC FILTER - MAINTENANCE PRACTICES

1. General
 A. The hydraulic filter elements must be changed periodically to avoid filter clogging and fluid contamination in accordance with current inspection intervals. (Refer to 5-00-00)
 B. The filters are located on the hydraulic panel in the tailcone and are accessible through the tailcone access door.
 C. Removal and installation of both pressure and return filter assemblies is identical.
 D. Removal and installation of both pressure and return filter elements is identical with the exception of filter bowl torque values.

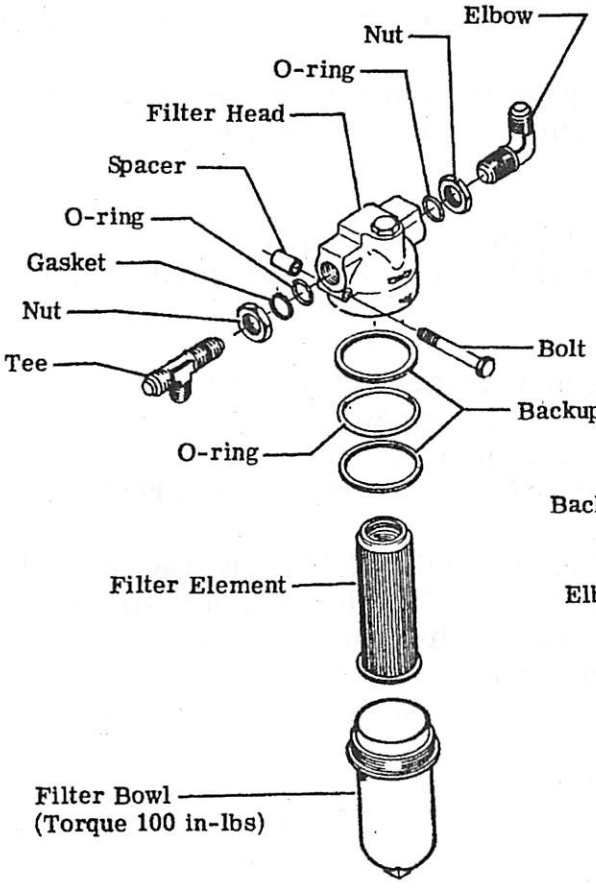
2. Removal/Installation
 A. Remove Hydraulic Filter Element (See figure 201)
 (1) Lower tailcone access door and disconnect battery quick-disconnects.
 (2) Depressurize hydraulic system.
 (3) Unscrew filter bowl; remove and discard filter element.
 B. Install Hydraulic Filter Element (See figure 201)
 (1) Clean filter bowl and install new element.
 (2) Inspect O-ring and backup rings for serviceability and replace if necessary.
 (3) Fill bowl, with filter installed, with MIL-H-5606 hydraulic fluid.
 (4) Install bowl, torque and safety wire. Torque pressure filter bowl to 150 inch-pounds. Torque return filter bowl to 100 inch-pounds.
 (5) Pressurize system and check for leaks.
 (6) Connect battery quick-disconnects and secure tailcone access door.
 C. Remove Hydraulic Filter Assembly
 (1) Lower tailcone access door and disconnect battery quick-disconnects.
 (2) Depressurize hydraulic system.
 (3) Disconnect and cap lines at hydraulic filter.
 (4) Remove two bolts securing hydraulic filter to hydraulic panel and remove filter assembly.

 NOTE: Spacers are installed on bolts behind filter assembly. Do not lose spacers.

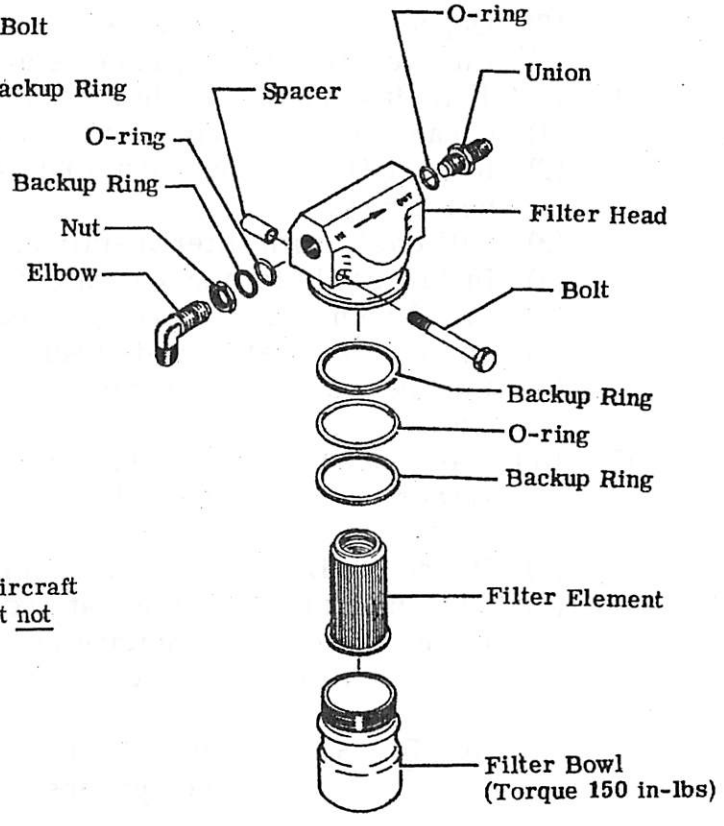
 D. Install Hydraulic Filter Assembly
 (1) If a new filter assembly is being installed, install fittings using new O-rings.
 (2) Remove filter bowl and fill bowl, with filter element installed, with MIL-H-5606 hydraulic fluid.
 (3) Install bowl, torque and safety wire. Torque pressure filter bowl

to 150 inch-pounds. Torque return filter bowl to 100 inch-pounds.

(4) Insert bolts through holes in filter head and slip spacers over bolts from back side of filter.
(5) Position filter on hydraulic panel and tighten bolts.
(6) Remove caps and connect hydraulic lines to filter assembly.
(7) Pressurize system and check for leaks.
(8) Connect battery quick-disconnects and secure tailcone access door.



Hydraulic Pressure Filter on all Aircraft
Hydraulic Return Filter on Aircraft not modified by AMK72-2.



Hydraulic Pressure Filter,
Aircraft 25-090 and Subsequent and
Aircraft Modified by AMK72-2.

Hydraulic Filter Assembly
Figure 201

HYDRAULIC ACCUMULATOR - MAINTENANCE PRACTICES

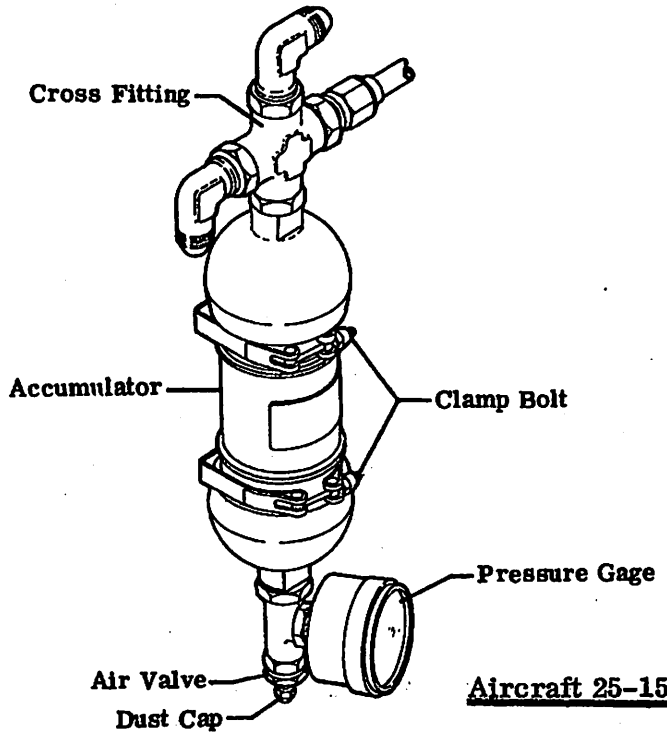
1. General
 A. The hydraulic accumulator is mounted on the hydraulic panel located in the tailcone section of the aircraft.
 B. The hydraulic accumulator is accessible through the tailcone access door.
 C. Extreme caution should be exercised when releasing air pressure from accumulator. Remove dust cap and loosen end nut 3/4 turn. Do not loosen or remove air valve assembly to release air.

2. Removal/Installation
 A. Remove Hydraulic Accumulator (See figure 201)
 (1) Close hydraulic supply shutoff valves. (Refer to 29-00-00)
 (2) Lower tailcone access door and disconnect battery quick-disconnects.
 (3) Depressurize hydraulic system.

 WARNING: DO NOT RELEASE ACCUMULATOR AIR PRESSURE BY LOOSENING OR REMOVING AIR VALVE. THE VALVE MAY BLOW OUT, POSSIBLY CAUSING INJURY.

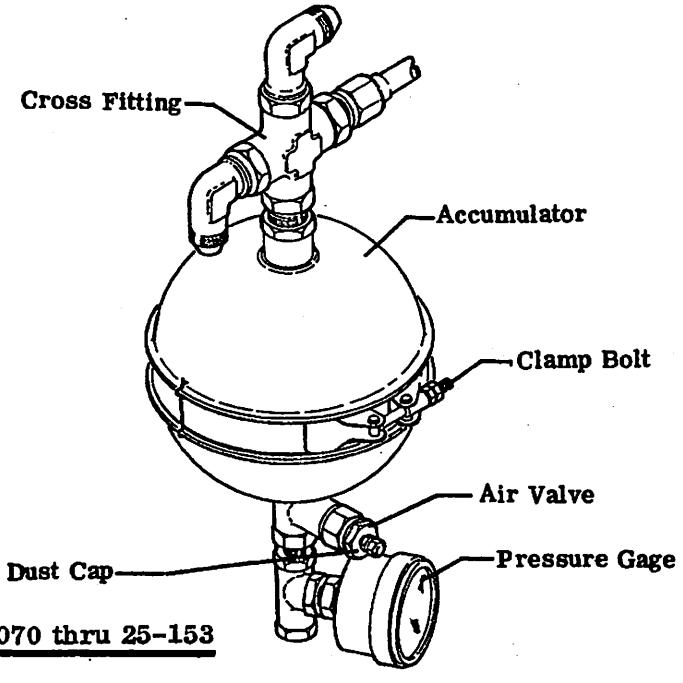
 (4) Release accumulator air charge by removing dust cap and loosening end nut 3/4 of a turn to release air pressure.
 (5) Remove and cap tubes from three fittings attached to cross fitting.
 (6) Support accumulator and loosen clamp bolt until clamp is loose enough to release accumulator and remove accumulator from aircraft.
 B. Install Hydraulic Accumulator (See figure 201)
 (1) Position accumulator at clamp position and tighten clamp bolt.
 (2) Attach tubes to cross fitting using new O-rings.
 (3) Open hydraulic shutoff valves.
 (4) Service accumulator. Refer to 12-00-00.
 (5) Connect battery quick-disconnects and secure tailcone access door.

3. Approved Repairs
 A. Disassemble and Clean Hydraulic Spherical Accumulator (See figure 202)
 (1) Remove cross fitting and fittings from accumulator.
 (2) Remove air valve and pressure gage, as a unit, from the accumulator by removing air valve body from accumulator.
 (3) Discard all O-rings and packings.
 (4) Unscrew air and hydraulic halves of accumulator making note of complete turns required to separate halves.



Aircraft 25-154 and Subsequent

CYLINDRICAL ACCUMULATOR



Aircraft 25-061, 25-070 thru 25-153

SPHERICAL ACCUMULATOR

Hydraulic Accumulator Installation
Figure 201

(5) Remove diaphragm from accumulator.
(6) Clean accumulator halves with PS-661 solvent.
(7) Clean fluid and air screen with compressed air, making sure screens are unobstructed.
(8) Clean inside of air and fluid ports.

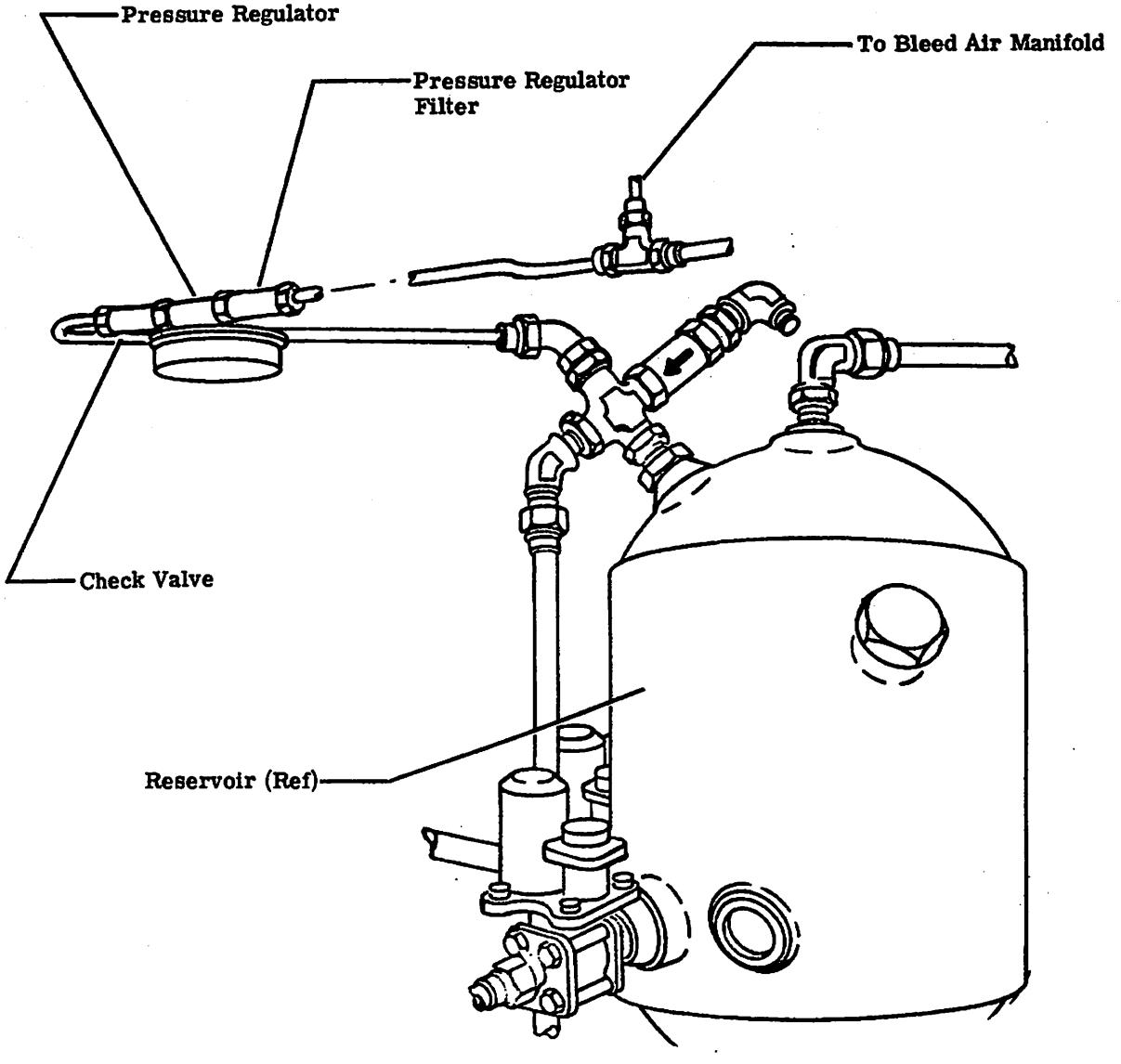
B. Assemble Hydraulic Spherical Accumulator (See figure 202)
(1) Position diaphragm in air half of accumulator aligning groove on diaphragm with bead on accumulator.
(2) Screw fluid half of accumulator into air half until lines scribed on accumulator rims align and the number of turns determined in disassembly procedure is attained. This seals the air and fluid halves of the accumulator.
(3) Inspect all fittings for serviceability. Replace if necessary.
(4) Install air valve and pressure gage on accumulator using new packings.
(5) Install fittings on accumulator using new O-rings and packings.

PRESSURE REGULATOR FILTER - MAINTENANCE PRACTICES

1. General
 A. Maintenance practices include removal and cleaning of the pressure regulator filter.
 B. The pressure regulator filter is located in the line between the bleed air manifold and the reservoir pressure regulator.
 C. The pressure regulator filter must be removed periodically in accordance with current inspection intervals. (Refer to 5-00-00)

2. Removal/Installation
 A. Remove Pressure Regulator Filter (See figure 201)
 (1) Lower tailcone access door and disconnect battery quick-disconnects.
 (2) Disconnect bleed air line from filter and filter from pressure regulator.
 B. Install Pressure Regulator Filter (See figure 201)
 (1) Attach filter to pressure regulator.
 (2) Connect bleed air line to filter.
 (3) Connect battery quick-disconnects and secure tailcone access door.

3. Cleaning/Painting
 A. Clean Pressure Regulator Filter (See figure 201)
 (1) Clean pressure regulator filter with MEK and thoroughly dry filter with clean dry air.



Pressure Regulator Filter Installation
Figure 201

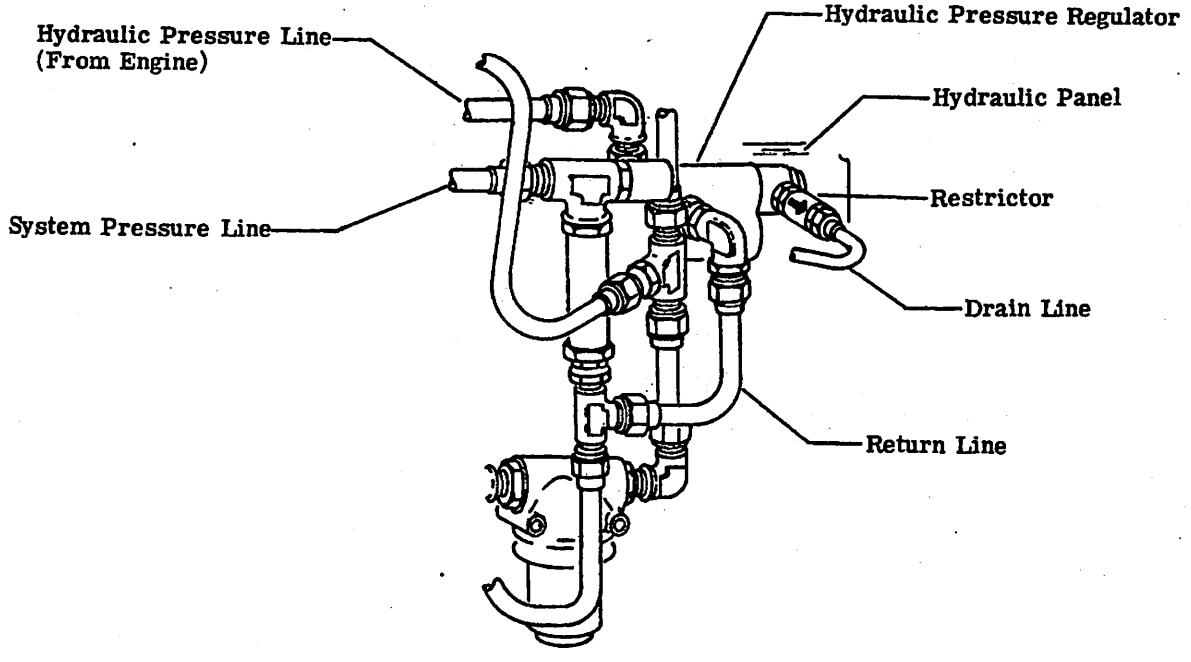
HYDRAULIC PRESSURE REGULATOR - MAINTENANCE PRACTICES

1. General
 A. The pressure regulator is installed on the hydraulic panel in the tailcone equipment section.
 B. The pressure regulator is installed in the pressure line from the engine driven pumps. The regulator maintains the aircraft hydraulic pressure at the required level.

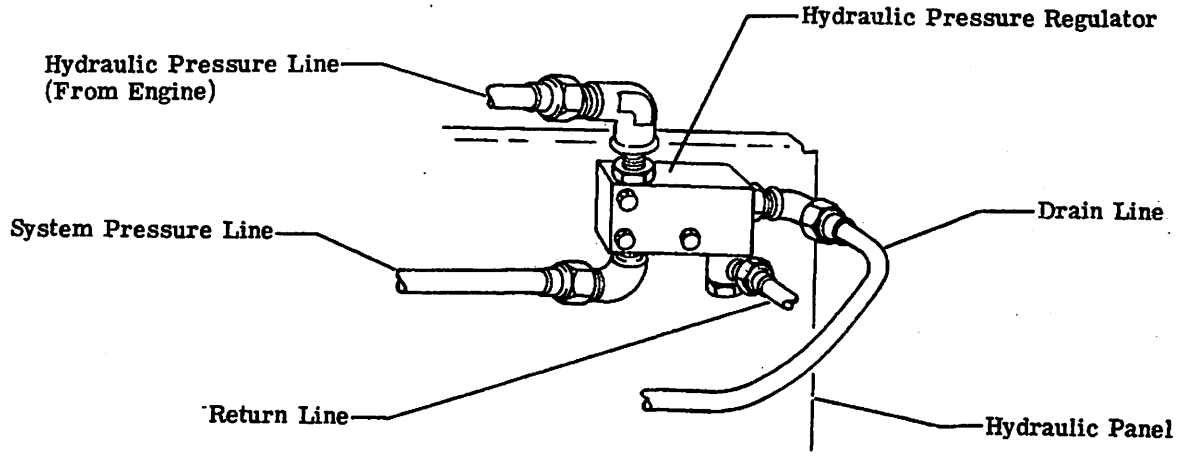
2. Removal/Installation
 A. Remove Hydraulic Pressure Regulator (See figure 201)
 (1) Open tailcone access door.
 (2) Close hydraulic shutoff valve.
 (3) Depressurize the hydraulic system.
 (4) Disconnect tubing from return, drain, system, and pressure port elbow fittings.
 (5) Remove three bolts and washers attaching regulator to hydraulic panel and remove regulator from airplane.
 (6) Remove elbows, restrictor (when installed), O-rings and packings from regulator ports. Discard O-rings and packings.
 (7) Inspect elbows and restrictor for serviceability and retain if serviceable.
 B. Install Hydraulic Pressure Regulator (See figure 201)

 NOTE: On aircraft 25-090 and 25-101 thru 25-153, when installing restrictor, place regulator on table with drain port up. Fill port with MIL-H-5606 hydraulic fluid then install restrictor. This will prevent the trapping of air between restrictor and regulator housing.

 (1) Install elbows, restrictor (when installed) and new O-rings and packings in return, drain, system pressure and engine pressure ports of regulator.
 (2) Position regulator on hydraulic panel and install three washers and bolts.
 (3) Connect return, drain, system and pressure tubes to respective ports.
 (4) Open hydraulic shutoff valves.
 (5) Close tailcone access door.
 (6) Start engines and bring hydraulic pressure up to normal operating pressure. Operate flaps or spoilers and check regulator for operation and leaks.



Aircraft 25-061, 25-070 thru 25-153 except Aircraft modified per SSK 952 (Installation of AN6295 Hydraulic Pressure Regulator)



Aircraft 25-154 thru 25-180 and prior Aircraft modified per SSK 952 (Installation of AN6295 Hydraulic Pressure Regulator)

Hydraulic Pressure Regulator Installation
Figure 201

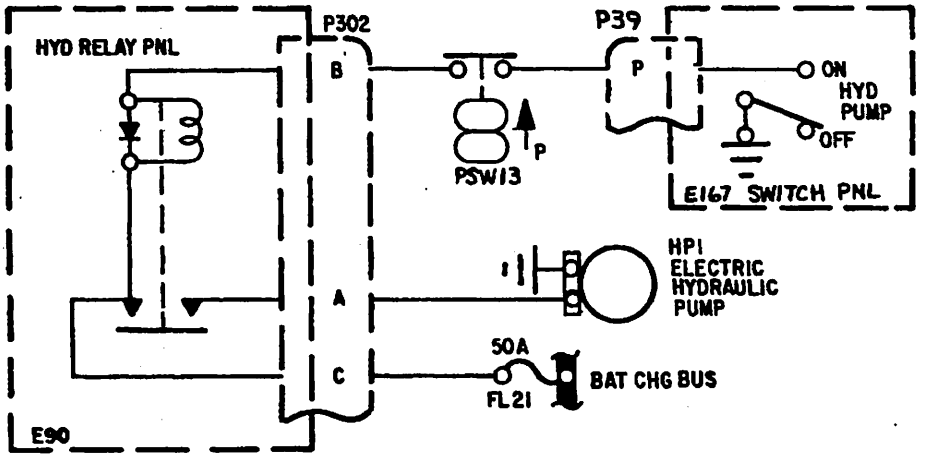
AUXILIARY HYDRAULIC PUMP - DESCRIPTION AND OPERATION

1. Description
 A. The auxiliary hydraulic pump is installed on the hydraulic panel located in the tailcone section of the aircraft.
 B. The electrically driven auxiliary hydraulic pump provides hydraulic system pressure for inflight standby power.
 C. The auxiliary hydraulic pump is controlled by the Hydraulic Pump Switch and cycled automatically by a pressure switch located in the system pressure line.

2. Operation (See figure 1)

 CAUTION: OPERATE AUXILIARY HYDRAULIC PUMP A MAXIMUM OF 3 MINUTES ON AND 20 MINUTES OFF TO PREVENT OVERHEATING AND BURNOUT OF PUMP MOTOR.

 A. With the Hydraulic Pump Switch set to HYD PUMP, an abnormal drop in hydraulic system pressure will actuate the pressure switch and energize the pump.
 B. The auxiliary pump draws fluid from the bottom or reserve portion of the reservoir. This assures that fluid will be available even with low fluid in the reservoir.
 C. When normal system pressure is restored the pressure switch will reset and deenergize the pump.
 D. On aircraft equipped with pressure switch (P/N 730605), the switch will open at 1400 (±50) psi and close at 1200 (±100) psi. On aircraft equipped with pressure switch (P/N 730617), the switch will open at approximately 1140 (±50) psi and close at approximately 1300 (±40) psi.

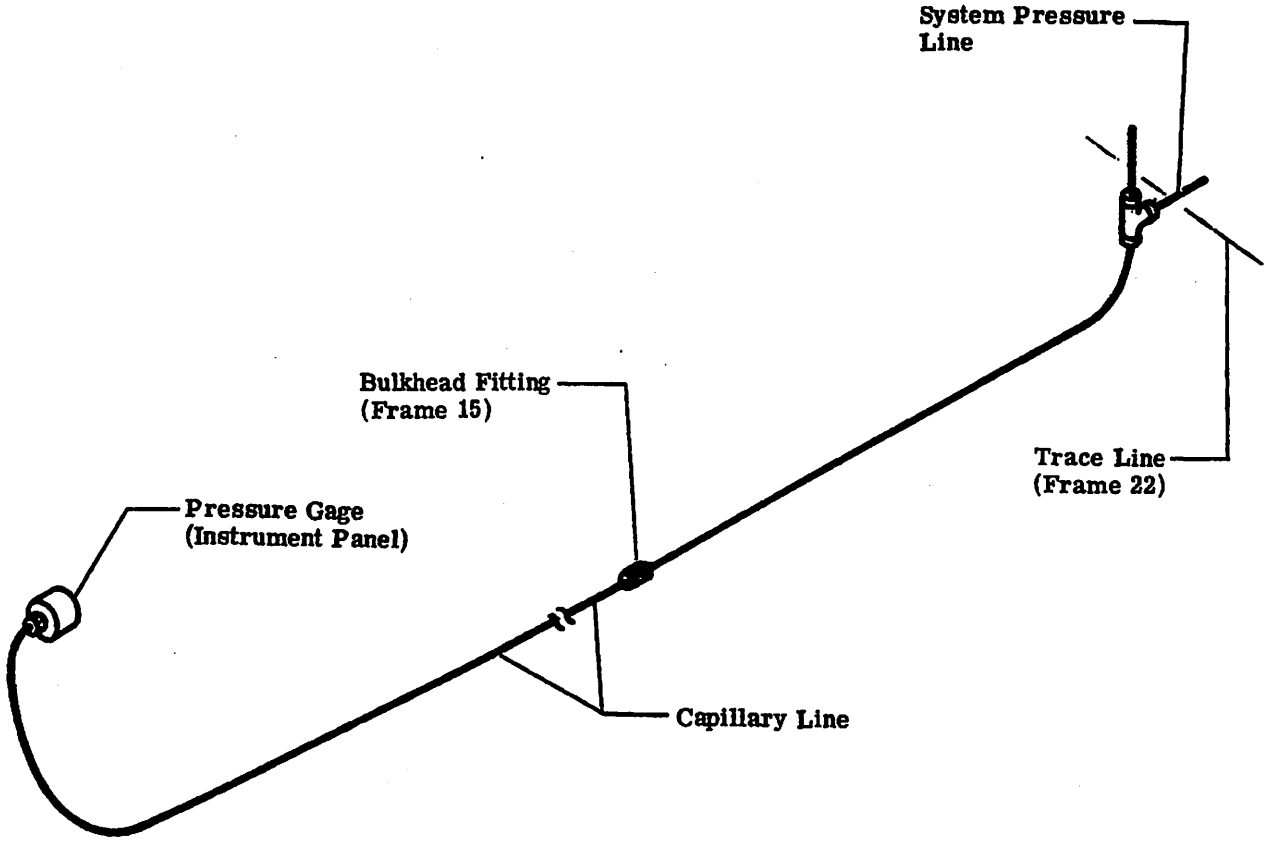


Auxiliary Hydraulic Pump Electrical Control Schematic
Figure 1

INDICATING - DESCRIPTION OPERATION

1. General
 A. The hydraulic system is equipped with two direct reading pressure gages. One is located on the instrument panel and the other is located in the tailcone equipment section of the aircraft.

2. Description
 A. The direct reading hydraulic pressure gage located in the tailcone section is for use by service personnel when servicing the hydraulic system. The gage is plumbed to the air side of the hydraulic accumulator. The gage indicates the air charge of the accumulator. The accumulator is charged to 850 psi with dry air or nitrogen.
 B. The direct reading hydraulic pressure gage on the instrument panel gives a constant hydraulic pressure indication to the pilot and copilot. The gage is plumbed to the hydraulic pressure line in the tailcone by a capillary line.



Hydraulic System Pressure Gage Installation
Figure 1